

# The Role of Ochre in the Middle Stone Age



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Cover illustration: *One of the two cross-hatched ochre pieces from Blombos Cave, South Africa.* © Christopher Henshilwood, Smithsonian Magazine July 2008  
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## **Abstract**

Red ochre is widely distributed at Middle Stone Age (MSA – for list of abbreviations see Appendix 1) sites. Ritual and utilitarian interpretations have been proposed for its occurrences, resulting in an ongoing debate regarding the role ochre played during the African MSA. During the last decade, the ochre debate has intensified. This has resulted in two main views on the context within which ochre was used within; a ritual and a utilitarian. There is a substantial body of evidence supporting both views, raising the question as to whether ochre was used within several different contexts. In this thesis, a literature study of ochre material from central sites in this debate has been tested on theoretical grounds to see if it is possible to determine what role ochre played during the MSA and if it was used within several contexts. It is argued on the basis of the characteristics of ritual theory that red ochre was used for both ritual and utilitarian purposes during the MSA, thus implying that ochre had several different roles and was used within different contexts. On the basis of transformation theory, it is argued that ochre connected to utilitarian objects could have been transformed for use in ritual activity, thus implying that ritual and utilitarian functions for ochre were connected, at least in some cases. Based on this, I propose that ritual behaviour was present in Sub-Saharan- and eastern Africa from the early MSA, and that this activity developed and spread to the rest of Africa and the Levantine around 100 ka.



# 1. INTRODUCTION

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Ochre, a general term for hydrated iron oxide that can produce a coloured streak, is a well known prehistoric feature frequently connected to ritual behaviour at sites from the Upper Palaeolithic in Europe (ritual behaviour is defined in Chapter 3). In this context, ochre is normally found as a red powder associated with burials (e.g. Chase and Dibble 1987:272-276; Kuhn, et al. 2009:98; Mellars 1989:361; Mellars 1999; Schepartz 1993:116; Vanhaeren and d'Errico 2005:6; Wreschner, et al. 1980:631; Zilhão, et al. 2010:1027). Although black ochre occurs, red is the most common ochre colour used at Upper Palaeolithic sites (e.g. Bar-Yosef 1993:98, 100; Knight, et al. 2003; Zilhão, et al. 2010). Ochre from the Upper Palaeolithic is also found in the form of utilized pieces such as “crayons” (pieces with multiple facets converging to a point) (e.g. Bordes 1952; Byers 1994:387; Marshack 1989:12; Mellars 1989:361; Schepartz 1993:116; Wreschner, et al. 1980:639), fragments (e.g. McBrearty and Brooks 2000:525; Vanhaeren and d'Errico 2003:12), and rubbed/scraped pieces (e.g. Marshack 1981:188), together with stains on artefacts (e.g. Kuhn, et al. 2009:98; Wreschner, et al. 1980:631, 642; Zilhão, et al. 2010:1023), residue on cobble hammers, upper/lower grindstones and lithics (e.g. Kuhn, et al. 2009:98; Vanhaeren and d'Errico 2003:12; Wreschner, et al. 1980:632), and as unmodified nodules. With few exceptions, practically all of these occurrences could be aspects or stages of the process of producing ochre powder, and thus be connected to ritual activities, such as burials (e.g. Vanhaeren and d'Errico 2003:1; Vanhaeren and d'Errico 2005:6), ritual depositions of objects (e.g. Wreschner, et al. 1980:632) or body decoration (e.g. Byers 1994:386; Marshack 1981:190). With little scrutiny, a ritual function for ochre with an origin in the European Upper Palaeolithic was generally accepted, to the exclusion of alternative explanations.

Through their comprehensive article, McBrearty and Brooks (2000:Figure 13) demonstrate that all of the apparently unique features of the Upper Palaeolithic are also present in Africa, but at an much earlier date. They point to the wide distribution of predominantly red ochre in the early African Middle Stone Age (MSA), which lasts from c. 300 - 250 ka to c. 40 ka (for list of time periods, see Appendix 2 and 3) (e.g. Barham 2000;

Barham 2002b; Beaumont and Vogel 2006; Cochrane 2006; Cruz-Urbe, et al. 2003; Deino and McBrearty 2002:186; Grün and Beaumont 2001; Henshilwood, et al. 2002:1278; Jacobs, et al. 2006; Lombard 2005a; Mackay and Welz 2008; Marean, et al. 2007; McBrearty 2001b; Mehlman 1979; Tryon and McBrearty 2002; Van Peer and Vroomans 2004; Wadley and Harper 1989; Watts 1999), and propose an alternative geographical and chronological setting for ochre utilization. Ochre from African MSA sites is mostly found in the same forms as ochre from the Upper Palaeolithic: ochreous powder, “crayons”, ochre stained lithics, beads and grindstones, nodules that are smoothed, polished or cut, and unmodified nodules (e.g. d'Errico, et al. 2005:16; Henshilwood, et al. 2004; Henshilwood, et al. 2009:29; Henshilwood, et al. 2002:1278; Lombard 2005a, 2006a, 2007; Mackay and Welz 2008:1525; Wadley 2005a:1; 2005b:13; Wadley, et al. 2009; Wadley, et al. 2003), with occurrences dating as far back the beginning of the MSA (e.g. Deino and McBrearty 2002:185; McBrearty 2001b:92).

Ochre at MSA sites however, is found in far greater quantities than at Upper Palaeolithic sites. For example, at Blombos Cave (Figure 1) almost 9000 pieces of ochre (both modified and unmodified) were found in layers dating 143 – 70 ka (Henshilwood, Sealy, et al. 2001). At Sibudu Cave in South Africa around 9000 pieces of worked and unworked ochre have been recovered from layers dated to ~60 ka (Hodgskiss 2010), and <70 kg of ochre is estimated to have been found from layers dated to as early as 400 ka to 140 ka from excavations at Twin Rivers Cave in Zambia (Barham 2002b). In addition, several kilos of ochre have been found at various other pre-100 ka sites (e.g. Barham, Pinto, et al. 2000:82-87; Marean, et al. 2007; McBrearty 2001b; Tryon and McBrearty 2002; Wadley and Harper 1989; Watts 1999:123) and ochre is present on almost every site (e.g. Klein Kliphuis, South Africa, Apollo 11, Namibia and Porc Epic Cave, Ethiopia) post-dating 100 ka (See Table 1 - 3 for examples, and Figure. 1, 5 and 6 for map/distribution) (Clark, et al. 1984; Henshilwood, et al. 2002; Mackay and Welz 2008; Watts 1999; Wendt 1976). As a consequence, the research focus on ochre has turned from the European Upper Palaeolithic to the African MSA in the last decade.



Figure 1: The approximate location of a number of sites mentioned in Chapter 1 which have yielded ochre. Illustration: Matrix African Studies Centre (2002)/the author.

In contrast to the European instances, it has been proposed that the presence of ochre at MSA sites is connected to a wide range of possible functions, only one of which is a role in ritual activity. Thorough analysis and interpretations of the various functions of MSA ochre have resulted in an ongoing debate (e.g. Barham 2005; Henshilwood, et al. 2009; Henshilwood, et al. 2002; Knight 2010b; Lombard 2005a, 2006a; Power 2004; Wadley 2005a; Wadley, et al. 2003; Watts 2002, 2009, 2010). This was initiated by the range of possible interpretations of engraved ochre pieces discovered at the MSA site of Blombos Cave in

South Africa (One example is illustrated on the cover of this thesis). These engraved pieces, dated to c. 77±6 ka, have been interpreted as symbolic and artistic, a commonly accepted feature of ritual activity (e.g. Bahn and Vertut 1997:193; Marshack 1996). Since then, it has been a source for recent proposals for ochre connected to a ritual origin in the African MSA (Knight 2009, 2010b; Knight and Power 2006; Power 2009; Watts 2009). Although a ritual function for ochre has been proposed by various researchers, the ritual interpretation has not been rigorously tested.

The newfound focus on ochre material at MSA sites has raised the question as to whether ochre was used in a variety of contexts'. This interpretation is based on recorded practical functions for ochre from ethnographic sources (e.g. Bocquentin and Bar-Yosef 2004; Clark 1975; Velo 1984), earlier suggestions of practical functions for ochre (e.g. Binford 1968; Cole 1954; Howell 1966; Keeley, et al. 1980; Keeley 1982; Knight 1987; Leakey 1958; Marshack 1981; Velo 1984, 1986; Wreschner 1976; Wreschner, et al. 1980), and occurrences at archaeological sites which suggest a more practical use (Wadley 2005a, b; Wadley, et al. 2003). Several utilitarian functions for ochre have been proposed, the most prominent being its use as an ingredient in mastic for hafting (e.g. Allain and Rigaud 1986; Backwell, et al. 2008; Barham 2002a; Cochrane 2006; Gibson, et al. 2004; Hodgskiss 2005; Keeley 1982; Lombard 2005a, 2006a, 2007; Rots 2003; Rots and Van Peer 2006; Rots, et al. 2011; Wadley 2005b; Wadley, et al. 2009; Wadley, et al. 2003) (for counter-argument see Watts 2009:73). This has been confirmed on a number of points and backed segments from Howiesons Poort layers at Rose Cottage Cave, Sibudu Cave and Umhlatuzana Rock Shelter in South Africa (e.g. Lombard 2002; Lombard 2005a:292-293; 2006a, 2007; 2008a:30; Wadley 2005a:7; 2005b; Wadley, et al. 2003; Williamson 2004:175; 2005), and been suggested as a possible ingredient in adhesives for tools believed to have been hafted from 300 ka layers at Twin Rivers Cave in Zambia (e.g. Barham 2002a:602; Wadley 2005b:13) and from Howiesons Poort levels at Klasies River main site (Wurz and Lombard 2007:9). Additional proposals of utilitarian use in the MSA include: ochre used for preparing/softening hide (e.g. Mandl 1961; Wadley, et al. 2003:662) (for counter-argument see Watts 2009:72), for medicinal purposes (e.g. Velo 1984), for protection against the sun, cold and insect bites (e.g. Henshilwood, et al. 2009:29; Hodgskiss 2010:3345; Wadley 2001:204), and as a dietary iron supplement (e.g. Lombard 2008b:183; Wadley 2001:204).

The arguments supporting both the ritual and utilitarian functions however, are based on the same extant collections of excavated material. There is strong evidence supporting a ritual interpretation for the engraved ochre from Blombos Cave (e.g. Henshilwood, et al. 2009; Henshilwood, et al. 2002; Watts 2009) and for the practical function for ochre found in adhesives at Sibudu Cave (Lombard 2005a, 2006a; Wadley 2005b; Wadley, et al. 2003). However, this does not apply to the rest of the enormous MSA ochre record. Several of the proposed signs of prehistoric ritual use of ochre (such as ochre powder and utilized nodules), are also argued to be characteristics of utilitarian use. The presence of such utilized ochre can be explained by the aforementioned utilitarian functions. Ochre powder and utilized lumps can thus be reminders of both ritual and utilitarian activities. The advocates of the ritual interpretations believe this indicates that ochre is solely used within a ritual context (e.g. Knight 2009; Knight 2010b; Watts 2002, 2009, 2010), whereas the advocates of the utilitarian interpretations state that ochre might have operated within several different contexts', including a utilitarian (Lombard 2005b:49; 2006a:65; 2007:415; Wadley 2005a:3; 2005b:13; 2010a:2404; Wadley, et al. 2003:672). Thus, as demonstrated, occurrences of ochre are interpreted in very different ways which have contributed to two main views on the use of ochre; ritual and utilitarian.

Costly Signalling Theory has been suggested as connected to ritual by a number of researchers (e.g. Alcorta and Sosis 2005; Knight 1999, 2008; Sosis 2000, 2003; Sosis and Alcorta 2003; Sosis and Bressler 2003; Zahavi and Zahavi 1997) and will here be used to test the ritual interpretation of ochre. The theory states that signals have to be reliable to be effective, and costly to be reliable. This can be achieved through collective ritual which should, according to Sosis and Alcorta (2003:265), leave traces of exaggerated formality, sequencing, invariability and repetition. Alcorta and Sosis (2005:347-348) state that the presence of such costly signals in the archaeological record would indicate ritual. Ritual signals could be strengthened through the incorporation of specific objects and colour (e.g. special ochre pieces and ochre in body-paint (e.g. Barham 2005:4; Henshilwood, Sealy, et al. 2001:445; Knight 2010b:309; Marean, et al. 2007:907; Power 1999:93-95; 2004:82-83; 2009:260; Watts 2002:2, 4; 2009:82, 90; 2010:394, 408)), making the signals harder to fake (Alcorta and Sosis 2005:29; Sosis and Alcorta 2003:265). Ian Watts (2002:2; 2009:62) has

argued that ochre used in costly signalling strategy, involving ritualized display, is expected to leave a loud archaeological signature.

According to Liénard and Sørensen (2010), ordinary objects may have different functions/meanings in different contexts. The model posits that because ordinary artefacts are readily identified and immediately recognizable within a group, the intended function or the role of the artefact may be readily manipulated or transformed (Liénard and Sørensen 2010:2). Thus, by taking the object from its ordinary context and employing it in another, the object is given a new meaning (Liénard and Sørensen 2010). The transformation of ordinary objects in collective ritual is one of the ritual details that “...activate the information-processing and motivation systems”. This makes the object salient and the ritual behaviour attention-grabbing (Liénard and Boyer 2006:821).

### **1.1 PROBLEM STATEMENT**

In the light of the fundamentals of these ritual models, the role of ochre will be re-examined to see if the characteristics of a ritual use are present at MSA ochre sites. The instances of a purely practical function for ochre will also be examined to see if it is possible to determine within which context they operated. By systematically examining ochre material from central sites in the ochre debate using the characteristics of collective ritual behaviour, as defined above, an attempt will be made to determine if it is possible to explain these two contrasting roles within the theoretical bounds given.

- Are there clear signs of exaggerated formality, sequencing, invariability and repetition at the sites?
- Is it possible to determine if ochre was considered costly?
- Is it possible to determine within which contexts’ the different ochre occurrences were used?
- Is it possible that the different forms of ochre use were connected, or
- that ochre had several different functions and was used within different contexts?

## 1.2 CONTEXT

It is first necessary to briefly outline the context for the ochre debate. The following pages will be devoted to a brief research history of this debate and its role in the overall development of research on the MSA.

The first indications of the ochre debate outlined above can be traced back as far as the mid 1900s (e.g. Binford 1968; Cole 1954; Howell 1966; Keeley, et al. 1980; Keeley 1982; Knight 1987; Leakey 1958; Marshack 1981; Velo 1984, 1986; Wreschner 1976; Wreschner, et al. 1980), although it did not reach its full extent until the beginning of this century. The reason for this was the disagreement surrounding where and when Anatomically Modern Humans (AMH) first developed. By the end of last century there was a general agreement regarding the origin of AMH in Africa close to 200,000 years ago (Aitken, et al. 1993; Excoffier 2002; Horai, et al. 1995). This marked a transition between the focus on human anatomy to the origin of cognitive *Homo sapiens*. Today, one of the most debated topics in prehistoric archaeology is when and where Modern Human Behaviour (MHB) developed (e.g. Bar-Yosef Mayer, et al. 2009; Barham 1998, 2002b; d'Errico, et al. 2003; d'Errico, et al. 2005; Henshilwood 2007; Henshilwood, et al. 2004; Henshilwood and Marean 2003; Henshilwood and Marean 2006; Hovers and Belfer-Cohen 2006; Hovers, et al. 2003; Jerardino and Marean 2010; Knight, et al. 1995; Marean, et al. 2007; Wadley, et al. 2009; Watts 1999, 2002, 2009). This behaviour was first believed to have originated in Europe where widespread and substantial indications of modern behaviour corresponding to the beginning of the Upper Palaeolithic were found (e.g. Cassirer 1944; De Laguna 1970; Holloway 1969; Howell 1966; Humphrey 1998; Kuhn, et al. 2009; Leakey 1958; Mellars 1999; Valladas, et al. 1992; Valladas, et al. 2001; Vanhaeren and d'Errico 2003, 2005; White 1959; Zilhão, et al. 2010). In 2000 McBrearty and Brooks published a comprehensive article forcefully arguing the need to acknowledge the African material when discussing MHB. They stressed the considerable number of publications documenting early signs of MHB in Africa, many of which were from sites with substantially older dates than those in Europe (e.g. Barham 1995; Barham 1998; Beaumont and Vogel 2006; Cruz-Urbe, et al. 2003; McBrearty and Brooks 2000; Van Peer and Vroomans 2004; Watts 1999).

How modern behaviour should be recognized in the material record is not readily agreed upon. However, certain features of the MSA record, such as rituals, ochre use and personal ornamentation, which are believed to require the ability to multitask, store information outside the body and the capacity for abstract thought, are broadly agreed upon and believed to be indications of MHB (e.g. Assefa, et al. 2008; Balme, et al. 2009; Botha 2008; Bouzouggar, et al. 2007; Chase 1994; Chase and Dibble 1987; Chase and Dibble 1992; d'Errico, et al. 2003; d'Errico, et al. 2001; d'Errico, et al. 2005; d'Errico and Nowell 2000; d'Errico, et al. 2010; d'Errico, Vanhaeren, Barton, et al. 2009; d'Errico, et al. 2008; d'Errico and Vanhaeren 2007; Deacon 1995; Deacon 1997; Henshilwood 2007; Henshilwood, d'Errico, et al. 2001; Henshilwood and Marean 2003; Henshilwood and Marean 2006; Henshilwood, et al. 2009; Hovers, et al. 2003; Knight 1985; Knight, et al. 1995; Lindly, et al. 1990; Marean 2010; Marshack 1981, 1989, 1990; Power 2009; Power and Aiello 1997; Power and Watts 1997; Vanhaeren 2005; Vanhaeren, et al. 2006; Watts 1999, 2002; Wreschner, et al. 1980; Zilhão, et al. 2010). The presence of ochre has been of particular importance on African MSA sites (e.g. Bar-Yosef Mayer, et al. 2009; Barham 1998; Barham 2002b; Deino and McBrearty 2002; Henshilwood, et al. 2009; Henshilwood, et al. 2002; Hodgskiss 2005; Hovers, et al. 2003; Knight 2009, 2010b; Mackay and Welz 2008; McBrearty 2001a; McBrearty, et al. 1996; Power and Aiello 1997; Watts 2002, 2009, 2010). Together with evidence of other features commonly believed to be connected to MHB, such as the aforementioned use of personal ornamentation and ritual activity, ochre use has been central in trait lists endeavouring to explain the origin of MHB in an African context.

Based on their broad knowledge of the African MSA material, a list developed by McBrearty and Brooks (2000) is perhaps the best example, regarding today's African context, of what such trait lists might contain. According to McBrearty and Brooks (2000:491), MHB should be detected through:

- increasing artefact diversity;
- standardization of artefact types;
- blade technology;
- worked bone and other organic materials;
- personal ornaments and “art” or images;
- structured living spaces;



- ritual;
- economic intensification, reflected in the exploitation of aquatic or other resources that require specialized technology;
- enlarged geographic range;
- expanded exchange networks.

In their list, ritual is characterized as one of the central components for MHB. However, McBrearty and Brooks (2000:534) emphasize that such lists in general lack theoretical foundation and that they are based on characteristics present when evidence of the origin of modern behaviour corresponded to the European Upper Palaeolithic and/or traits derived from the ethnographical record. The absence of a theoretical framework that stipulates the actual circumstances that might have led to the emergence of MHB makes it difficult to detect the emergence of modern behaviour with the help of such lists (Henshilwood and Marean 2006:44; Shea 2011:7). Consequently, publications of archaeological discoveries that are claimed to be signs of MHB have been heavily debated and rarely agreed upon. Proposition of new trait lists has therefore declined the last decade, and the focus has mainly been on a few features broadly believed to be “modern”: the use of ochre, personal ornamentation and ritual activity (e.g. Bar-Yosef Mayer, et al. 2009; Barham 1998, 2002b, 2005; Botha 2008; Bouzouggar, et al. 2007; d'Errico, et al. 2005; d'Errico and Vanhaeren 2009; Henshilwood, et al. 2004; Henshilwood, et al. 2009; Henshilwood, et al. 2002; Knight 2009, 2010a; Lombard 2006a, 2007; Mackay and Welz 2008; Marean, et al. 2007; Power 2004; Soriano, et al. 2009; Van Peer, et al. 2003; Van Peer and Vroomans 2004; Wadley 2005a, b, 2006b, 2010a; Wadley, et al. 2009; Wadley, et al. 2004; Wadley, et al. 2003; Watts 2002, 2009, 2010). Ritual activity will be focused on here as a theoretical foundation for its occurrences has been developed and is broadly agreed upon by ethologists, anthropologists and archaeologists. This will not, however, serve as proof for the existence of MHB, but give an indication of the complexity of the human mind during the MSA.

Although ritual is generally accepted as a “modern” feature, McBrearty and Brooks (2000) argue that signs of ritual activity are hard to trace in the African archaeological material, mostly because ritual activity does not necessarily leave an intelligible trace and because subtle traces are difficult to interpret with certainty. Therefore they downplay ritual as a possible route to trace the origin of MHB. Also, as mentioned above, ochre could have

served several utilitarian purposes, suggesting that a ritual explanation cannot be inferred every time.

Still, in recent years a ritual interpretation of the MSA ochre material has been argued for by a number of researchers (Henshilwood, et al. 2009; Henshilwood, et al. 2002; Knight 1999, 2008, 2009, 2010b; Knight and Power 2006; Power 1999, 2004, 2009; Watts 1999, 2002, 2009, 2010). Because red ochre is the most widely occurring pigment at archaeological sites it might, according to Watts (2009, 2010), also be one of the most prominent ritual features throughout prehistory, and thus have played a vital part in MSA rituals. In addition to the archaeological interpretation of excavated ochre material, several anthropologists have argued for the use of red ochre in prehistory, primarily in relation to ritual performance (e.g. Knight 1987; Knight 1991; Knight 1998, 2000; Knight, et al. 1995:76; Power 1999). Based on the newfound archaeological interest in ochre use in the MSA in the last decade and arguments concerning the great quantities, antiquity and consistent colour choice of ochre in the MSA, anthropologists argue that ochre might have had a central role in MSA rituals (e.g. Knight 2008; Knight 2009, 2010b; Power 2004, 2009). The models on which they base this argument, together with hypotheses and arguments concerning utilitarian use of ochre, are briefly outlined in the following chapter.

## 2. HISTORY OF RESEARCH – INTERPRETATIONS REGARDING THE MIDDLE STONE AGE OCHRE ASSEMBLAGE

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### PRE-2000

Hide preparation/hide tanning was the foremost hypothesis concerning the utilitarian use of ochre during the MSA in the mid 1970's (Keeley, et al. 1980:170-176). It was argued that the iron compounds in ochre could soften hide and deter decomposition. The discoveries of smoothed/polished ochre pieces also suggested its use on a soft surface such as hide. The iron compounds also possess documented healing properties. It was therefore suggested that the early occurrences of ochre might be medicinal (e.g. Velo 1984; Velo 1986:2-3; Wreschner, et al. 1980:632). Ochre as medicine is reported from the ethnographic record where ochre would be moistened and applied to sores or mixed with cold ash and used in the treatment of burns (Velo 1984:674; 1986). It has been claimed that it is not unlikely that early man learned about the healing properties of ochre through experience (Velo 1984). As the iron salts in ochre have antiseptic and deodorizing properties, it was proposed that ochre was used for keeping sores free of infections and was perhaps applied to the body to hinder the worst perspiration (Velo 1984:674). In addition, ochre was at an early stage believed to have been used as a central component in adhesives used for hafting (Keeley 1982), or for protection against the sun (Figure 2), cold and insect bites (e.g. Knight, et al. 1995).



Figure 2: Namibian Himba woman and child covered in red ochre for protection against the harsh sun. Photo by Erik Recendez (2008).

Ever since the earliest reports of red ochre at prehistoric sites (e.g. Binford 1968; Howell 1966; Leakey 1958; Wreschner 1976), ochre has often been considered as connected

to ritual activity, presumably due to its presence in graves in the European Upper Palaeolithic. As ochre seemingly was a recurrent feature in these burials, it was assumed by many that ochre had a ritual function in prehistoric times (e.g. Marshack 1981; Wreschner, et al. 1980). In Africa, anthropologists argued for ochre used in ritual connected to sexual selection. Those who support the sexual selection theories seek the answer for the early use of ochre in human behavioural patterns, both in the prehistoric- and ethnographic record (e.g. Knight 1987, 1997; Power 1999; Power and Aiello 1997; Power and Watts 1997; Watts 1999, 2002). Set out from premises in human behavioural ecology, it was proposed that the seemingly preferred use of red ochre was connected to menstrual blood and reproduction strategies by coalitions of females (The Female Colour Coalitions model, or FCC, will be outlined in 2.1.3) The FCC model is partly based on ethnographic evidence; such as Australian myths and rituals regarding the menstrual cycle where females would participate in collective “bleeding” or in ritual dance where women would dance for coitus (Knight 1987:276; Power 1999). The female coalitions thus practise a measure of sexual self-control.

## **POST-2000**

### **2.1 TWO VIEWS ON OCHRE**

From the very beginning of the debate, there have been different opinions on which frame of reference ochre was used within. The researchers behind these different interpretations are roughly divided into anthropologists (e.g. Chris Knight, Camilla Power and Leslie Aiello) and archaeologists (e.g. Lyn Wadley, Marlize Lombard and Veerle Rots). The archaeologists suggest a utilitarian purpose for the soft rock, whereas the anthropologists believe ochre had a ritual purpose. However, some archaeologists, although less specific in their assumptions (such as Ian Watts and Lawrence Barham), also believe ochre was used in ritual (Barham 1998, 2002b, 2005; Watts 2002, 2009, 2010). From c. 2002 and onwards, two seemingly opposing views on ochre are established.

#### **2.1.1 Utilitarian use of ochre**

Since 2000, a number of archaeologists have strongly argued that the presence of ochre does not necessarily reflect ritualized behaviour, at least not in every case (e.g. Gibson, et al.

2004; Hodgskiss 2010; Lombard 2005a, b, 2006a; Lombard 2007; Rots and Van Peer 2006; Rots, et al. 2011; Wadley 2005a, b, 2010a; Wadley, et al. 2009; Wadley, et al. 2003; Williamson 2004, 2005). Instead they argue for ochre used in other utilitarian functions, such as in medicine and for protection against the elements.

The hide preparation/hide tanning hypothesis continues to be a debated function for ochre today. As mentioned above, ochre has been showed to have antiseptic properties, which would be beneficial in hide preparation. To be effective in hide preparation however, soluble iron salts are necessary, something that is not a property of most ochre minerals (Watts 2009:72). Although experiments conducted by Mandl (1961) have confirmed that iron salts are effective in destroying collagen in animal hide, field experiments have failed to demonstrate that ochre oxide has any preservative effect or that the preservative property of ochre is colour-dependent (Watts 2009:72). Based on this experiment, the hypothesis that ochre was used for the preparation of hide would not explain the vast majority of reds on archaeological sites. However, as seen in Khoisan societies, ochre could have been applied in the finishing stages of hide preparation as a decorative inclusion (Watts 2002:3).

Based on several discoveries of ochre connected to hafting on a number of MSA sites, the foremost among the utilitarian hypothesis for ochre use is as an emulsifier in mastic used as adhesives for hafting (e.g. Klein 2009; Lombard 2007, 2008a; Lombard and Wadley 2007; Rots and Van Peer 2006; Rots, et al. 2011; Wadley 2003, 2005a, b, 2010a, c; Wadley, et al. 2009; Wadley, et al. 2004; Wadley, et al. 2003). Wadley and Lombard point to lithic material from Howiesons Poort layers (c. 60,000 ka) from Sibudu Cave and Umhlatuzana Rock Shelter, and have with the help of microscopy analyses, provided direct evidence of ochre-bearing adhesive residue at the artefacts proximal end and medial section (e.g. Lombard 2005a:Table 4; Lombard 2006a:62). They state that the findings are consistent with what is seen in experimental work, where the ochre residue would concentrate around the proximal end, medial part, or in a combination of these two positions (Wadley 2005b:12; Wadley, et al. 2003). The experimental work further shows that ochre effectively stimulates mastic to congeal when dried and prevents the mastic from breaking under pressure (Villa, et al. 2005:412; Wadley 2005b:11; Wadley, et al. 2009:2; Wadley, et al. 2003:670).

Watts (2010:394) has argued that there should be no colour preference when ochre is used for hafting as both yellow and red ochre have proved effective in experimental hafting (Wadley 2005b; Wadley, et al. 2009:2). In addition there is evidence from the ethnographic record that organic materials such as plant fibre, dung, dirt, sand, powdered shell and charcoal, were used and have proven to be just as effective filler/loading agents as ochre powder (Watts 2009:73). Based on this, Watts (2009:73) argues that the predominance of red ochre at MSA sites cannot be explained by the hafting hypothesis. Wadley (2005b:Table 1) shows in her experiments however, that tools hafted with yellow ochre and resin were not as successful as tools hafted with red ochre and resin. In addition, replication studies by Wadley (2010a:2398) demonstrate how yellow ochre positioned in the sand 5-10 cm under a fire successfully turn into red or shades of red, suggesting that some of the red ochre might originally have been yellow. This has been suggested as an explanation for the predominance of red ochre at MSA sites.

Wadley (2009:3-4) has argued that a mixture of coarse components seem critical for the compound adhesive to be successful. Watts (2010:394) highlights the fact that due to the chemical properties of ochre, fine-grained ochre is more likely to undergo uniform colour change than the coarse-grained variant which is necessary for hafting. This does not mean however that coarse-grained ochre cannot change colour, but suggests that if yellow ochre were transformed to red for use in hafting, beneficial changes in chemical properties, as well as colour occur during alteration.

Furthermore, Watts (2009:73) argues that the results of the experimental grinding presented by Wadley (2005a:5), where seven hours of grinding produced 70 ml of ochre powder (enough for 28 hafts), makes it unlikely that the vast amount of ochre at sites such as Twin Rivers (with an estimate of <70kg of ochre from the original excavation) should reflect ochre extraction for solely utilitarian purposes. Using the numbers from this experimental grinding study, Wadley (2005b:13) has estimated that at sites providing up to 20.000 lithics, only 5 % (1000) of them need to show traces of ochre residue for 60 kg of parent ochre rock to have been used. The experimental grinding study also shows that ochre “crayons” (Figure 3) may not have been used as crayons at all. They may instead be waste products from ochre grinding (Wadley 2005a:8). The amount of time spent and the small

amount of powder gained by such grinding in this experiment suggests a possible connection between hafting and ochre “crayons” (Wadley 2005a:7).



Figure 3: Example of ochre "crayon". Photo by author.

Although the advocates of the utilitarian school of ochre do not see ochre as having a ritual function, they do see it as a possible sign of “modern behaviour”. Wadley, et al. (2009:4) argue that the use of red ochre in combination with mastic to produce compound adhesives for hafting, was not for decorative purposes. The ochre was used to transform the mastic into a more durable material, and in some cases the ochre was itself transformed. This transformation implies an understanding of the chemical processes that take place in the making of compound adhesives in a combination of heat, emulsifier and mastic and suggest that its makers possessed the abilities for multitasking and abstract thought, central for cognitive behaviour (Wadley, et al. 2009:4). Based on this, it is likely that the predominance of red ochre at MSA sites was not accidental, but collected for a specific purpose.

### 2.1.2 Colour selection



Figure 4: The approximate location of Skhul and Qafzeh Cave in Israel.  
Illustration by: Google Earth/the author

One of the central topics in the ochre debate has therefore been its colour. Although several different colours are found at archaeological sites, red ochre represents the vast majority of earth pigments in the MSA context (e.g. Bar-Yosef Mayer, et al. 2009; Barham 2005; Bouzouggar, et al. 2007; d'Errico, et al. 2005; Deino and McBrearty 2002; Henshilwood, d'Errico, et al.

2001; Henshilwood, et al. 2004; Henshilwood, Sealy, et al. 2001; Henshilwood, et al. 2009; Henshilwood, et al. 2002; Hodgskiss 2010; Hovers, et al. 2003; Lombard 2007; Mackay and Welz 2008; Marean, et al. 2007; Wadley 2005a, b; Wadley, et al. 2003; Watts 2009, 2010; Wreschner, et al. 1980). In 1969, Berlin and Kay proposed a hypothesis for the evolution of colour use; the Basic Colour Term (BCT) theory. It explains the features of colour labelling as connected to biological human foundations and claims that as language and culture developed, so did the use of colour pigment evolve (Berlin and Kay 1969; Hovers, et al. 2003:513). The 71 >92,000 year old ochre pieces from Qafzeh Cave in Israel (Figure 4), suggest that the preferred colour during the MSA was a variety of red and pale pink, something that according to Hovers, et al. (2003) correlates with BCT. The hypothesis, which predicts that colour definitions emerged in the same order in a process that led to MHB, has been suggested as a defining link between the use of colour and the arising of cultural modernity (d'Errico, et al. 2010:3100). Based on this theory, Hovers et al. (2003:493) stress that in languages where more than the two basic colour terms "Black" and "White" exists, they are universally followed by the term for "red", as with the contemporary Ndembu tribe of Zambia (Berlin and Kay 1969:26; Turner 1985 [1966]:47-82).



“The properties structuring the universality of color categorization have been traced to and correlated with the neuro-optical processes involved in human trichromatic color vision (e.g., types of retinal receptors for different wavelengths of light, the neural machinery that measures the relativity of photon capture in the different classes of receptors), and the dimensions of human color perception (lightness, hue, and saturation) (Mollon (1997) and references therein).” (Hovers, et al. 2003:493)

Mollon (1997:391-392) state that we only share this trichromatic colour vision and colour perception with Old World monkeys and one genus of New World monkeys. Hovers, et al. (2003:493) argue that this is consistent with the use of ochre pigment in prehistory where black and red pigments are the earliest and most abundant colours to emerge at prehistoric sites. Lawrence Barham (2003:511) has pointed out however, that the use of black is almost exclusively a European feature, except perhaps from c. 100 ka layers at Pinnacle Point, South Africa (Watts 2010:399), and MSA levels at Ysterfontein 1, South Africa (Klein, et al. 2004:5709). If this colour triad can be traced as far back as the separation from the Old World monkeys, then we should expect to find more than scattered occurrences of ochre at Neanderthal sites (Barham 2003:511). Thus, the MSA ochre record is inconsistent with the original BCT hypothesis, suggesting that this cannot explain the preference for red hues at these sites.

Knight et al. (2003:513) point to flaws in the originally proposed triad hypothesis by Brent Berlin and Paul Kay (1969), and stress that many tribes, including the Ndembu, only have two terms, and that these terms are not black versus white, but rather light/warm versus dark/cold. This is more consistent with the revised formulation by Kay and McDaniel (1978) where light/warm (white, yellow and red) versus dark/cold (black, green and blue) are the basic colour terms. In this context, red and pale pink would indeed be expected to be among the first colours to emerge at prehistoric sites (Watts 2002:3). As red followed by yellow are the most common colours at MSA sites however, there is no support for the dark/cold term. Evidence of possible colour-alteration by heat and a clear predominance of red nuances from African MSA sites such as Blombos, Pinnacle Point 13B, Twin Rivers and Sibudu Cave suggests that this theory might need revision (Watts 2010:409).

If the value of the red ochre at MSA sites cannot be explained by biological colour labelling, then it must have derived from some other cause. Ernst Wreschner (1976:718) also interprets the use of red ochre as biologically conditioned. He believed it was selected for its similarity in colour to the life-giving blood. It is possible that this could explain the consistent use of “blood” red ochre found at most MSA sites (e.g. Barham 2002b; Barham 2005; Henshilwood, et al. 2009; Henshilwood, et al. 2002; Watts 2002, 2009, 2010). As mentioned previously, Velo (1984) believe that ochre was first used as medicine. Based on similar arguments, Wreschner, et al. (1980:632) argues that through its application, the medicine could have created a relationship between red ochre and the human body. Grinding ochre into a fine powder and mixing it with animal fat or urine, results in a product that resembles blood in both colour and consistency. Wreschner, et al. (1980:633) postulates that it is possible that prehistoric people could have made a connection between this healing substance and their own life-giving-blood. This is supported in the ethnographic record where e.g. red ochre is associated with blood in the Aboriginal legend of the Unthippa women (Bettelheim 1962:97), as well as in the Ndembu tribe where red ochre clay represents the blood of the “mother” when used to colour the river red in rituals connected to the river source (Turner 1969:53). Thus, as is true for many contemporary tribes, a link between the red ochre and blood might be plausible. This association is further expanded upon by hypotheses surrounding ritual use of ochre.

### **2.1.3 Ritual use of ochre**

The ritual view of ochre use is roughly divided into ochre used in ritual for sexual selection and ochre used in for example rituals establishing identity, trust and commitment within a group. The former argues that the manipulation of red ochre provided more beneficial conditions for sexual selection (Power 1999:99). The Female Colour Coalitions (FCC) model suggests that ochre was connected to fertility and the menstrual cycle (Knight 2009:296-298; Power 2009:99). This theory is partly based on the belief that a need for more extensive infant care and higher energy foods is related to the arising encephalization and correspondingly smaller guts (the expensive-tissue hypothesis, outlined in Aiello and Wheeler (1995)) around 500 ka (Barham 2004:111; Power 2009:267), together with the presence of intensively utilized red ochre at MSA sites. According to Chris Knight and Camilla

Power, non-menstruating females would paint themselves with red ochre and “fake” menstruation when another in their kin coalition was menstruating to confuse males by showing the same reproductive signal at the same time, allowing them to control male attention and claim high energy foods (e.g. Knight 1987, 2010a; Power 2004). The strategy could also be used to attract outsider males and their labour to the coalition (Knight 2009; 2010b:299; Power 2004:76; 2009). The FCC model therefore predicts that the earliest evidence of symbolic behaviour should be found in a cosmetic industry focused on “blood-red” colour pigment (Power 2004:75). As shown by Knight (2010b:309), and his layout of the FCC model, females who synchronize and conceal ovulation at strategic times, and thereby control male access to the (imminently) fertile female, gain generally increased mating effort and proportionate male attention. To prevent males from picking and choosing between them and to gain equal mating opportunities, the females paint up with red ochre. Power (2009:269-270) states that this system distributes male attention and mating effort evenly among the whole female coalition. Thus, the cycling female shows costly commitment to the coalition and gains long-time trust and extensive kin support. At the same time, the costliness of the cosmetic display by the female coalition would testify to the level and quality of the coalitionary support available to the fertile female. This support system would be attractive for males wishing to secure their offspring (Knight 2010b:299; Power 2009:270).

Based on traditions practiced in contemporary Hadza, San and Khoisan groups in Africa, Power and Aiello (1997:159) propose that the manipulation of fertility and ovulation signals would form a pre-adaptation to ritual, resulting in ritualized behaviour when taboos were constructed on fertility signals. Knight (2010b:299) states that for such signals to be reliable, they had to be costly and hard to fake. Illustrated with two lists, Knight (1999:Table 12.1) outlines un-costly versus costly signals, or, as he calls it, *speech versus ritual*. The lists consist of the characteristics of speech and ritual, and demonstrates clearly that ritual demands much more effort and work than speech (Knight 1999:231). This, he states, shows that ritual is a costly signalling medium. Alongside Power (1999), he believes that the high demand in time and energy of the FCC rituals and the high-quality cosmetics possibly used in these rituals reflect such costly signals.

These hypotheses derive from Darwinian Theory where signals must be reliable to be effective, and costly to be reliable (Zahavi and Zahavi 1997). The signalling displays such as the ones mentioned above, reflect such costliness and are therefore considered ritualistic. The sexual selection theories however, are partly based on ethnographic studies and myths. Besides the presence of large amounts of utilized red ochre, they do not have any solid foundation in the archaeological record. Assigning present day beliefs and ritual aspects onto prehistoric cultures is problematic as we then assume that MSA people behaved and understood things the same way we do today. This will be discussed further in Chapter 5. Even if it is difficult to establish specific rituals at MSA sites, some archaeologists believe that the material record may be able to tell us if rituals in general were present at MSA sites.

#### **2.1.4 Ochre in rituals and its “loud archaeological signature” (Watts 2009)**

Based on the large amount of red ochre at MSA sites, it has been argued that ochre occurrences at African MSA sites could be connected to ritual activity (Knight 1999; Watts 2009). Watts (2009:62) predicts that ochre was used in rituals based on its “loud archaeological signature”. Due to its bright colour and generally large amount, red ochre is hard to overlook at an archaeological site. Also, because ochre occurs in more or less the same forms at all the sites it is easily comparable to other locations. In fact, besides stone tools, ochre is the only recurrent artefact class at MSA sites (Watts 2009:63). Founded on this archaeological visibility, it has been suggested that red ochre could be the remainder of ochre use connected to collective representations in ritual activity (Barham 1995:4; Wreschner 1976:717). Ochre powder, perhaps used for body painting/decoration, and ochre engravings could reflect such traditions (Barham 2002b:189; Durkheim 1912 [1969]; Henshilwood, et al. 2009:43; Watts 2002:2; 2009:65). As shown by Knight’s (1999:Table 12.11) and Watts’ (2009:Table 4.1) lists of what ritual should consist of, rituals have to be costly to signal social commitment. It has been argued that the vast amount of ochre at MSA sites and the great effort put into obtaining the right kind of ochre could reflect such costly displays. At Blombos Cave, South Africa, ochre extracted at locations some distance from the caves seems to have been preferred over the local variant, suggesting that time and energy was put aside for this task (Watts 2009:83).

Terrence Deacon (1997:402) states that ritual facilitates the transition from concrete sign-object associations (indices and icons) to abstract sign-sign associations. The engraved Blombos ochre is in Watts' view a clear reflection of such ritual signs (Watts 2009:65). It provides evidence of social and stylistic elaboration, and represents the most extensively preferred colour in the MSA (Barham 1998, 2002b, 2005; Henshilwood, Sealy, et al. 2001; Henshilwood, et al. 2009; Marean, et al. 2007; McBrearty and Stringer 2007; McBrearty and Tryon 2006; Watts 2002, 2009, 2010). The amount of ochre found at the different sites seems to have varied (Table 1) but, with the exception of the yellow ochre found at Sai island in Sudan (Rots and Van Peer 2006:69; Van Peer, et al. 2003:1), the choice of colour is consistent (Barham 1998, 2005; Deino and McBrearty 2002; Marean, et al. 2007; McBrearty 2001b; McBrearty and Stringer 2007; McBrearty and Tryon 2006; Watts 2002, 2009, 2010). This is true even at sites with an occupation period possibly stretching as far back as c. 400 ka, such as Twin Rivers in Zambia, where <70kg of red ochre has been recovered (Barham 2002b).

**Table 1: MSA ochre occurrences at some central African sites mentioned in the text**

Site/Cave	Country	Mass	Unit	Dated to:	Reported ochre minerals	Reference
Twin Rivers	Zambia	<70 kg	A Block and F Block	c. 400 - 266 ka, c. 200 - 140ka	Specularite, Haematite, Limonite, Ferruginous sandstone, Manganese dioxide,	(Barham 2002b)
GnJh-15, Kapthurin Formation	Kenya	c. 5 kg/>70 items	K3 Sediments	>285 ka	Haematite	(McBrearty 2001b; Tryon and McBrearty 2002)
Mumbwa	Zambia		Unit III-XIII	>172 ±22 ka – c.23 ka	Haematite, specularite, ferruginous sandstone, yellow sandstone, limonite	(Barham 2000)

**Table 1: Continued**

<b>Site/Cave</b>	<b>Country</b>	<b>Mass</b>	<b>Unit</b>	<b>Dated to:</b>	<b>Reported ochre minerals</b>	<b>Reference</b>
Pinnacle Point Cave 13B	South Africa	1032 potential pieces of ochre (380 pieces/ 1,08 kg classified as “pigment”)	LC-MSA Lower	164 ka	Iron oxide, fine sandstone, coarse siltstone, siltstone, shale	(Marean, et al. 2007)
Blombos Cave	South Africa	c. 9000 pieces	Layers CL-CP	>143-70 ka	Haematite, sandstone, shales, siltstone, coarse siltstone	(Henshilwood, et al. 2002; Jacobs, et al. 2006)
Rose Cottage Cave	South Africa	1,57 kg/>89 pieces	Sequential units: 242-81 inches.	c. 130-60 ka	Haematite	(Wadley and Harper 1989; Watts 1999)
Sibudu Cave	South Africa	c. 5500 pieces, almost 700 of these are worked.	Squares B5 & B6, layers SIB 1 – SIB 14	c. 77 - 50 ka	Haematite, goethite, dolerite, quartz	(Cochrane 2006; Hodgskiss 2010; Lombard 2005a; Wadley 2010a)
Klein Kliphuis	South Africa	919 pieces, one engraved ochre piece	D2	>55 ka	Haematite	(Mackay and Welz 2008)

The ochre sites listed in Table 1, together with sites listed in Watts (2009:Table 4.2) and the sites marked on Figure 5 and 6, bear witness of the extensive use of ochre in the entire MSA (including documentation for regular use in some tropical areas by >300 ka (Barham 2002b; Deino and McBrearty 2002; McBrearty 2001b)), with a particular preference for red ochre minerals (See Appendix for colour and density of ochre minerals referred to in the text). This colour, Watts (2002:2) argues, is a highly contrastive and eye-catching hue, which would be very effective if used in relation to visual ritual signals. Durkheim (1912 [1969]) predicted that the first form of art should consist of geometric designs, painted in red ochre on the bodies of ritual performers. Watts (2009:82) argues that the geometric

ochre engravings at Blombos ochre could resemble such non-figurative designs made on the human body in rituals. Watts (2010:392) also argues that body decoration could be used as a medium for communicating institutionalized relationships through a system of “*agreed upon canons of ornamentation*”. Barham (2002b:182) has expressed similar views and suggests that the rich ochre material at Twin Rivers (Figure 1.) reflects ritual mechanisms conducted to create and maintain individual or group identities. He believes that such display of identity is closely intertwined with use of symbols as indication of self-awareness (Barham 1998:708). Barham (2002b:186) states that the enormous <70 kg ochre material from the Early Stone Age - Middle Stone Age transition (see Appendix 2 for Time-frame) at Twin Rivers in Zambia cannot be explained by purely functional use, and that the systematic use of pigments here indicates a purposeful and repeated activity, perhaps linked to a material expression of self-awareness, displayed in the form of body paint/body decoration. Thus, according to the arguments presented by Watts and Barham, the large amount and bright colour of MSA ochre could be signs of ritual activity.

## **2.2 SUMMARY**

Over the past 20 years, two main views of ochre-use have gradually been established. After 2002, around the time the engraved Blombos ochre was published, the ochre debate was more clearly split into a utilitarian and a ritual view of what ochre was initially used for. The segregation is roughly divided into archaeologists (utilitarian) and anthropologists (ritual), with some archaeologists arguing for ritual use, but in a less specific manner. The archaeologists who believe ochre was used for utilitarian purposes during the MSA argue for the use of ochre as a filler/loading agent in adhesives, in hide preparation, as medicine or as protection against the elements. In this context, ochre was a purely functional material. The anthropologists on the other hand, believe ochre was used as an agent to gain favourable conditions in relation to sexual selection. In this context, ochre was used for example as body paint or as a medium to create abstract imagery, and was thus a reinforcing factor in ritual. The anthropologists argue that this ritual utilization of ochre can be found ethnographically and connect it to a hypothesis called the Female Colour Coalitions (FCC) model. A less specific approach to the ritual use of ochre is taken by a few archaeologists who believe ochre was used in general collective rituals. They focus on the archaeological

material and argue that the large amount, consistent colour choice and intensive utilization bear witness to the use of ochre in ritual, perhaps in relation to establishing group identity and trust, and to enhance commitment to the group.

All of the hypotheses mentioned above, ritual perhaps more than the utilitarian, claim to be able to explain the amount and the evident preference of red ochre on African MSA sites. However, can the mere presence of red ochre at a site be seen as proof of ritual activity? And can we be sure which context the ochre was used within (excluding ochre in mastic and engraved ochre)? In this thesis, the MSA ochre record will be re-evaluated to try to determine the role ochre played at African MSA sites. To be able to do this, a theoretical framework for how ritual behaviour will be understood in this thesis is outlined in the next chapter. This will help determine whether ritual activity can be identified at MSA sites and if ochre was used within different contexts.



### 3. RITUAL THEORY AND METHODOLOGY

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It has been argued that the predominance of red ochre at MSA sites would suggest that it was collected for its visual salience, which would presuppose a signalling context (Watts 2002:3). The cost in time and energy to procure the right kind of ochre, together with processing and use of red ochre in the MSA might, according to Watts (2002:3), imply a stereotyped and costly signalling behaviour, a trait that is listed as typical in ritual behaviour and display by Knight (1999:231), Watts (2009:64), Zahavi & Zahavi (1997), and Sosis and Alcorta (2003:267). As costly signals would be expected to leave visible signs in the archaeological record, a theoretical model focusing on costly signals will be an ideal foundation to test if the MSA ochre record reflects ritual behaviour.

#### 3.1 COSTLY SIGNALLING THEORY

According to Sosis (2003:100), the costly signalling theory of ritual posits that *“ritual performance is a signal that advertises an individual’s level of commitment to the group”*. To gain honest signals of commitment, to prevent an individual from defecting, and to deter outsiders from taking advantage of a community, credible costly-to-fake signals are designed to maintain cooperative intentions towards the community (Zahavi and Zahavi 1997). According to Zahavi & Zahavi’s (1997) handicap principle, signals and acts must be costly to be reliable. Commitment to a group can in that context be shown through a costly ritual. Knight (2008:10) states that such ritual signals must be dependable and hard to fake. In contrast to signals that can be easily imitated by *free-riders* who do not wish to invest in the cooperative activities, ritual performance is designed to enhance commitment to the community and thereby strengthen intragroup cooperation (Sosis and Alcorta 2003:267). Such costly signals demand high individual costs to gain great collective benefits (Alcorta and Sosis 2005:20). The costly signals are believed to gain in costliness through the incorporation of a negative stimulus, further ensuring the absence of free-riders (Alcorta and Sosis 2005:20). These signals are dependent on the quality of the signaller and the right recipients to be useful. This could be ensured by collectively performed rituals (Sosis 2003:102; Sosis

and Alcorta 2003:267). Based on this, “rituals” will in this thesis be understood as effortful behaviour that project costly-to-fake signals.

Sosis and Alcorta (2003:265) have produced a commonly agreed upon list of recurrent components of ritual that could help shed light on what to expect as archaeological signs of prehistoric ritual. According to Sosis and Alcorta (2003:265), both anthropologists and ethologists agree that ritualized behaviour is a form of communication and should consist of:

1. exaggerated formality;
2. sequencing;
3. invariability; and
4. repetition.

These criteria *“have been selected to facilitate communication by eliciting arousal, directing attention, enhancing memory, and improving associations”* (Sosis and Alcorta 2003:265). Some of those involved in the interpretation of ochre at African MSA sites have used similar criteria lists to test the material. As mentioned earlier, both Knight (1999:231) and Watts (2009:64) have created a list of what they believe constitute ritual behaviour. In contrast to the lists published by the anthropologists Sosis and Knight, Watts’ list is made from an archaeological point of view. Although based on Knight’s list, Watts’ list is shorter and contains elements easier to detect in an archaeological context. According to this list, ritual should consist of:

1. costly signals;
2. iconic and indexical;
3. high amplitude;
4. analog scale evaluation;
5. repetition/redundancy;
6. group-on-group and,;
7. focus on body boundaries and surfaces.

Although the two lists presented above have produced similar characteristics for ritual, Watts' list is better aimed at identifying identity and/or religious rituals, whereas Sosis' and Alcorta's list would be effective in identifying rituals in general. Both will be used in order to cover both the anthropological and the archaeological views on what to expect as trace of prehistoric ritual. This way, more possibilities will be considered. Sequencing, invariability, repetition, redundancy, costly signals, iconic and indexical display, exaggerated formality and high amplitude are possible to detect in the archaeological record as these would be expected to leave visible signs. It will therefore mainly be these characteristics that will be used to search for ritual activity. Although it will be difficult to find visible evidence of analog scale evaluation, group-on-group, and a focus on body boundaries and surfaces, these could be inferred by the presence of the other ritual characteristics. If ritual is possible to detect in the MSA ochre material today, it should be with the help of these two lists.

### **3.2 TRANSFORMATION THEORY**

Liénard and Sørensen (2010) have outlined a hypothesis that posits that one can change ordinary objects' functions/meanings if brought into a different context. Because ordinary artefacts are readily identifiable and immediately recognizable, the intended function or the role of the artefact can be manipulated or transformed, i.e. *"the tool is not used in accordance to its intended function"* (Liénard and Sørensen 2010:2). According to this hypothesis, familiar artefacts are combined with familiar actions in new ways, resulting in the object being brought into a new context where it is transformed according to the intention of the ritual. Thus, by taking the object from its ordinary context and employing it in another, the object is given a new meaning within that particular context (Liénard and Sørensen 2010). The transformation of ordinary objects in collective ritual is one of the details that *"...activate the information-processing and motivation systems"*, which makes the object salient and the ritual behaviour attention-grabbing (Liénard and Boyer 2006:821), an essential part of ritual activity. This theory will act as a foundation to test the possibility that MSA ochre occurrences were being used within different context's (see Chapter 5.9).

### **3.3 SUMMARY**

Costly signals would be expected to leave visible signs in the archaeological record and are therefore listed as one of the major characteristics of ritual by several researchers (Knight 1999; Watts 2009; Zahavi and Zahavi 1997). A theoretical model focused on costly ritual signals will therefore be used to determine whether ritual activity can be inferred on the MSA ochre record. Two theoretical lists with such ritual characteristics are presented above. Both will be used in order to cover both the anthropological and the archaeological views on what to expect as trace of prehistoric ritual at archaeological sites. Ochre occurrences at central sites in the ochre debate will be tested to see if the characteristics of these lists are present at the respective sites (see Chapter 5). The hypothesis presented by Liénard and Sørensen (2010) will help determine whether ochre was being used within different contexts (see Chapter 5).

## 4. PRESENTATION OF THE OCHRE MATERIAL

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There are a few major sites in the ochre debate that receive almost all the attention, for example Blombos Cave, South Africa, Twin Rivers, Zambia and Pinnacle Point 13B, South Africa (map on Figure 5). These sites however, are far from the only sites that have produced ochre (see Chapter 1). There are a multitude of different sites that have yielded ochre in different forms and sizes, proving that ochre are a recurrent feature at most MSA sites (Table 3). To determine the role of ochre during the MSA, a detailed description of the ochre assemblage is required. Most of the sites however, seem to have undergone too few excavations and at several sites, the lack of a detailed examination of the ochre material makes it difficult for this analysis to be conducted. Ochre from three well documented sites (Table 2 – highlighted in grey) has therefore been chosen as the ochre material from these sites is sufficiently described and published. These are:

- Twin Rivers, Central Zambia;
- Blombos Cave, Western Cape, South Africa; and
- Sibudu Cave, KwaZulu-Natal, South Africa.

These sites have produced large quantities of ochre in different forms, are well documented and are often referred to and analyzed by scientists working with ochre from the MSA (e.g. Barham 1995; Barham 1998, 2000, 2002b, 2005; Clark and Brown 2001; d'Errico, et al. 2005; Henshilwood, Sealy, et al. 2001; Henshilwood, et al. 2009; Henshilwood, et al. 2002; Hodgskiss 2010; Jacobs, et al. 2006; Knight 2010b; Lombard 2002, 2006a, 2008a; Wadley 2005a, b, 2010c; Wadley and Jacobs 2006; Watts 2009, 2010; Williamson 2004); however, all of these sites are located in southern Africa. This would restrict the results of the analysis by space and distance. Therefore, ochre material from four additional sites (Table 2 – highlighted in white) will be used to avoid this problem and to add supplementary detail to the analysis. This will also provide the opportunity to see if an ochre tradition is possible to trace through different parts of Africa. These sites are:

- Site GnJh-15, Kapthurin Formation, Western Kenya;
- Sai Island, Northern Sudan;

- Mumbwa Caves, Central Zambia; and
- Pinnacle Point 13 B, Western Cape, South Africa.

These seven sites (Figure 5) and a summary of their respective ochre material are presented in the table below:

**Table 2: Ochre material from the seven selected sites studied in this analysis**

Site/Cave	Country	Mass	Dated to:	Selected References
Twin Rivers Cave	Zambia	<ul style="list-style-type: none"> <li>• 67.9-69.3 kg of ochre is estimated to have been brought to the cave.</li> <li>• c.3.5 % of the material is modified.</li> <li>• Ochre “crayons” with rubbed facets</li> </ul>	c.400 - 266 ka c.200 - 140 ka	(Barham 1998, 2000, 2002a, b, 2005; Barham and Smart 1996; Clark 1971; Clark and Brown 2001; Watts 2009)
Blombos Cave	South Africa	<ul style="list-style-type: none"> <li>• c. 9000 ground, scraped, rubbed or unmodified pieces of ochreous material,</li> <li>• two engraved ochre pieces,</li> <li>• 13 incised ochre pieces,</li> <li>• incised/engraved and ochre-stained bone tools</li> <li>• Ochre stained <i>Nassarius Kraussianus</i> shell beads.</li> </ul>	>143-70 ka	(Botha 2008; d'Errico, et al. 2001; d'Errico, et al. 2005; d'Errico and Henshilwood 2007; Henshilwood 2007; Henshilwood, d'Errico, et al. 2001; Henshilwood, et al. 2004; Henshilwood and Dubreuil 2009; Henshilwood and Sealy 1997; Henshilwood, Sealy, et al. 2001; Henshilwood, et al. 2009; Henshilwood, et al. 2002; Jacobs, et al. 2006; Watts 2009)
Sibudu Cave	South Africa	<ul style="list-style-type: none"> <li>• c. 5500 pieces of ochre (from which almost 700 are worked)</li> <li>• lithics with ochre at the proximal and medial portions</li> <li>• ochre “crayons”</li> <li>• ochre on possible marine shell beads</li> </ul>	c. 77 - 50 ka	(Cochrane 2006; d'Errico, et al. 2008; Hodgskiss 2010; Hodgskiss 2005; Lombard 2005a, 2006a, 2007; Wadley 2001, 2005a, b, 2006a, 2010a; Wadley, et al. 2009; Wadley and Jacobs 2006; Wadley, et al. 2003)(Hodgskiss 2011, Personal communication)

**Table 2: Continued**

<b>Site/Cave</b>	<b>Country</b>	<b>Mass</b>	<b>Dated to:</b>	<b>Selected References</b>
Site GnJh-15, Kapthurin Formation	Kenya	<ul style="list-style-type: none"> <li>• &gt; 70 pieces of ochre, or c. 5 kg</li> <li>• Ochre stained grindstones</li> <li>• Red stained earth</li> </ul>	>285 ka	(Deino and McBrearty 2002; McBrearty 1999, 2001b, 2007; McBrearty and Brooks 2000; McBrearty and Tryon 2006; Tryon and McBrearty 2002)
Site 8-B-11, Sai Island	Sudan	<ul style="list-style-type: none"> <li>• 59 yellow and red ochre pieces, only some of which are grinded/scraped</li> <li>• Four possible grindstones/mortars</li> <li>• Yellow and red ochre streaks/stains on chert pebbles</li> </ul>	c. 223±9 - 152±10 ka	(d'Errico, Vanhaeren, Henshilwood, et al. 2009; Tryon, et al. 2006; Van Peer, et al. 2003; Van Peer and Vroomans 2004)
Mumbwa Caves	Zambia	<ul style="list-style-type: none"> <li>• &gt;87 pieces of ochre</li> <li>• 4.6 % show signs of modification</li> <li>• ochre “crayons”</li> </ul>	>172 ±22 – c. 23 ka	(Avery 2003; Barham 1995, 1996, 1998, 2000; Watts 2009)
Pinnacle Point Cave 13B	South Africa	<ul style="list-style-type: none"> <li>• 1032 potential pieces of ochre/1.977 kg (380 cases/ 1.08 kg classified as “pigment”),</li> <li>• 42 pieces modified.</li> </ul>	164 ±12 - 91 ka	(Jacobs 2010; Jerardino and Marean 2010; Marean 2010; Marean, et al. 2007; Marean, et al. 2010; McBrearty and Stringer 2007; Watts 2010)



Figure 5: The approximate location of the seven selected sites. Illustration: Matrix African Studies Centre (2002)/the author

#### 4.1 RARELY CITED OCHRE OCCURENCES

One of the difficulties in determining the role of ochre during the MSA is that research tend to focus on specific sites or materials, such as the engraved ochre from Blombos Cave and adhesive/lithic material from Sibudu Cave (e.g. Barham 1995, 2002b, 2005; d'Errico, et al. 2003; d'Errico, et al. 2005; d'Errico, et al. 2008; Deino and McBrearty 2002; Gibson, et al. 2004; Grine and Henshilwood 2002; Grine, et al. 2000; Henshilwood 2007; Henshilwood, d'Errico, et al. 2001; Henshilwood, et al. 2004; Henshilwood, et al. 2002; Jerardino and Marean 2010; Lombard 2004, 2005a, 2006a, 2011; Marean, et al. 2007; Marean, et al. 2010;



McBrearty and Tryon 2006; Rector and Reed 2010; Tryon and McBrearty 2002; Van Peer, et al. 2003; Van Peer and Vroomans 2004; Villa, et al. 2009; Wadley 2005a, 2010a, c; Watts 2009, 2010). This is partly due to the fact that most researchers only report on their own findings (e.g. Barham 2000; Barham 2002b; Deino and McBrearty 2002; Henshilwood, Sealy, et al. 2001; Henshilwood, et al. 2009; Henshilwood, et al. 2002; Mackay and Welz 2008; Marean, et al. 2007; Van Peer and Vroomans 2004; Wadley 2005a, 2010a; Williamson 2004). As a result, there is limited research which examines the entire ochre “picture” which may result in findings confined to only part of the ochre tradition. In 2009, Watts produced a list of Middle Palaeolithic (MP)/MSA potential pigment occurrences that shows that there is a multitude of different sites that have produced evidence of ochre use. These are often overlooked when the evidence of ochre use is reviewed (Watts 2009:Table 4.2). A number of such sites are listed in the table below, and marked on the map on Figure 6. This ochre material is for the most part only briefly mentioned in their respective publications. It is therefore difficult to draw any conclusion regarding the context within which these occurrences were used; however, the ochre material at these sites do resembles the ochre assemblages at the seven sites analyzed in this thesis, and will add weight to the final conclusions.

**Table 3: Rarely cited MSA ochre occurrences at African sites.**

Site	Country	Unit	Approx. Age	Mass/ Material	Reported ochre minerals	Reference
Wonderwerk	South Africa	Major Unit 7, Major Units 3-4	c. 790 ka  >350 - 276 ± 29 ka,	Red ochre pieces	Haematite and specularite	(Beaumont and Vogel 2006)
Duinefontein 2	South Africa	Horizon 3	>290-270 ka	-	Haematite	(Cruz-Uribe, et al. 2003)
Border Cave	South Africa (KwaZulu- Natal)	6BS  5WA  5BS	>227 ka, 227 ± 11 - 174 ± 9 ka, 166 ± 6 – 147 ± 6 ka	111 ochre pieces (8.1 % modified), or 0.33 kg (27.7 % modified)	Haematite and specularite	(Beaumont, et al. 1978; Grün and Beaumont 2001)

**Table 3: Continued**

Kalambo Falls	Zambia	Acheulean Lower, Acheulean Upper, Sangoan	182 ± 16 ka  182 ± 10 ka  76 ± 10 ka	Small pieces of soft ochre, some with rubbing facets and striations	Haematite, specularite, limonite, dolerite, kaolin, ferruginous schists	(Clark 1971; 2001:59, 665)
Mumba	Tanzania	Stratum VIB	132 ka	-	Haematite	(Mehlman 1979)
Mwulu's Cave	South Africa	-	c. 126 -100 ka	13 pieces of ochre (53.8% modified), or 0.48 kg (77.2% modified)	Haematite and Specularite	(Tobias 1949; Watts 1999)
Hollow Rock Shelter	South Africa	-	c. 126 – 100 ka	1123 pieces of ochre (8.4% modified), or 1.34 kg (45.5% modified)	Haematite and Specularite	(Watts 1999, 2002)
Klasies River Mouth	South Africa	-	c. 126 - 60 ka	217 pieces of ochre, or 3.81 kg	Haematite	(Deacon 1989; Watts 2002; Wurz 2000)
Apollo 11	Namibia	-	c. 126 – 60 ka	105 pieces of ochre (29.5% modified), or 0.89 kg (46.8% modified)	-	(Watts 1999, 2002; Wendt 1976)
Pomongwe Cave	Zimbabwe (Matopo Hills)	Area 1, lyrs 22-27	MSA (Charama – c. 125 ka)	Lumps and ground pencils of ochre	Mostly red haematite	(Cooke 1963)

**Table 3: Continued**

Bambata Cave	Zimbabwe	Middle and Upper zones	MSA (Charama – c. 125 ka)	Balls and fragments of yellow ochre. Pencils, fragments and balls of red and brown ochre.	Haematite	(Armstrong 1931; Cooke 1963)
Olieboompoort	South Africa	-	c. 120 - 100 ka	304 pieces of ochre (13.2% modified), or 11.95 kg (18.2% modified)	Haematite and Specularite	(Mason 1969; Watts 1999:Fig. 7.2 and 7.3 )
Umhlatuzana	South Africa (KwaZulu-Natal)	-	c. >90 ka	1721 pieces of ochre (8.5% modified), or 3.44 kg (14.5% modified). Ochre residue on lithics.	Haematite, Shale and Specularite	(Kaplan 1989; Watts 1999)
Porc Epic Cave	South Africa (Northern Cape)	Levels 1-8	<77 ka	214 small pebbles and lumps. 34 (15.9%) pieces modified	Haematite and specularite	(Clark, et al. 1984)
Boomplaas Cave	South Africa	-	c. 70 – 40 ka	133 pieces of ochre (18.8% modified), or 1.34 kg (16.9% modified)	-	(Miller, et al. 1993; Watts 1999)
Ysterfontein 1	South Africa	Upper and Lower Unit	c. 60-40 ka	29 ochre lumps	Red and possible black pigment	(Halkett, et al. 2003; Klein, et al. 2004)



Figure 6: The approximate location of sites less cited in the African MSA ochre debate. Illustration: Matrix African Studies Centre (2002)/the author

*Key to site abbreviations: A11: Apollo 11, BAC: Bambata Cave, BC: Border Cave, BPL: Boomplaas Cave, D2: Duinefontein 2, HRS: Hollow Rock Shelter, KF: Kalambo Falls, KKH: Klein Kliphuis, KRM: Klasies River Main, MC: Mumba Cave, MCA Mwulu's Cave, OBP: Olieboompoort, PEC: Porc Epic Cave, POC: Pomongwe Cave, RCC: Rose Cottage Cave, UMH: Umhlatuzana Rock Shelter, WWC: Wonderwerk Cave, YF1: Ysterfontein 1*

## 4.2 PRESENTATION OF THE OCHRE MATERIAL FROM THE THREE MAIN SITES

Information on the ochre material from the seven selected sites is presented below. This provides all available information concerning the ochre material and the circumstances it was found in as much detail as possible, so that the results will reflect the actual

circumstances as accurately as possible. This will provide a solid foundation for the analysis and a good premise for determining the role of ochre during the MSA.

#### 4.2.1 Ochre material from Twin Rivers, Zambia:

The hill top site of Twin Rivers in Zambia (Figure 7) was first excavated by J. Desmond Clark in 1954 and 1956 (Barham 2002b:182; Clark 1971), but with no description or report of the ochre assemblage. The archaeological record shows that the site has not been contaminated by other Stone Age deposits as the only other occupation of the site was during the Iron Age. A roof collapse sealed the MSA occupation layers, resulting in no later contamination (Barham 1998). As a result, the site was dated to 30 ka (Clark 1971:1212), using finite and infinite radiocarbon dating on speleothem (a secondary mineral deposit formed in caves by the action of water) from directly beneath the collapsed roof. In 1999, additional speleothem was collected for dating by mass spectrometry (TIMS) uranium-series (Barham 2002b:182). The estimated occupation for the site by this re-dating was 200 - 140 ka (F-

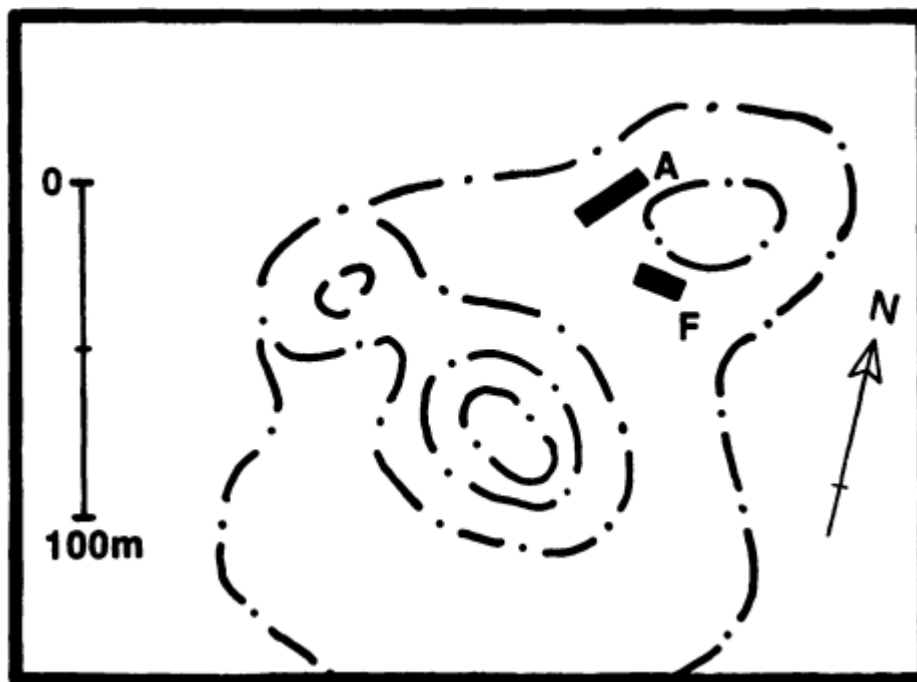


Figure 7: Plan view of the Twin Rivers hilltop in Zambia showing the location of F- and A-Block, after Clark (1971), (Barham 1998:704)

Block), and 350 – 266 ka (A-Block) and possibly as far back as 400 ka (Ascheulean to MSA transition period) for the oldest occupation levels (Barham 2002b:183; Watts 2009:76). Ochre has been found associated with these layers.

During preliminary investigations at Twin Rivers in 1996, one piece of limonite and three pieces of haematite were recovered (Barham 1998:703). The margins of Twin Rivers were then excavated by Barham in July-August 1999 (Barham 2002b:186). During the excavation, 302 pieces of different kinds of (pigmentous) ochre (Table 4) were discovered (Barham, Simms, et al. 2000:189). In addition, small flaking debris of several ochre types (mostly haematite and fragments of specularite) <10 mm in length (mostly 2 – 4 mm weighing under 1.0 g) were recovered from the 1999 excavation, with a total number of 892 pieces (762 from the A Block and 130 from the F Block) (Barham 2002b:186; Barham, Simms, et al. 2000:204).

Ochre mineral	A Block - Number of pieces	F Block - Number of pieces	A Block – per cent of total	F Block – per cent of total	A Block – weight in % of total	F Block – weight in % of total
Specularite	110 pieces	50 pieces	61.1 %	48.4 %	88.7 %	87 %
Haematite	48 pieces	59 pieces	26.7 %	41 %	1.8 %	4.5 %
Limonite	13 pieces	4 pieces	7.2 %	3.3 %	8.5 %	1 %
Ferruginous sandstone	8 pieces	8 pieces	4.4 %	6.6 %	0.9 %	7.5 %
Manganese dioxide	1 piece	1 piece	0.6 %	0.8 %		
Total	180	122	100 %	100 %	1.404 kg/100%	0.213 kg/100%

**Table 4: Frequencies, percentages and weight of ochre minerals in A and F Block at Twin Rivers, Zambia**

In the A Block, the average weight and size per piece is 15.4 g for specularite and 1.6 g for haematite. 31.5 % of all specularite pieces are <10 mm, and 76.1 % of all haematite pieces were <10 mm. In the F Block, 46.6 % of the specularite pieces were <10 mm and 95.2 % of all the haematite pieces were <10mm. Thus, the specularite assemblage is generally larger in

size and weight than haematite in both the A and F Block at Twin Rivers (Barham 2002b:185).

From the A Block, seven pieces of specularite (3.9 % of the ochre sample) show signs of alteration from use or from preparation. Of these seven (Barham, Simms, et al. 2000:Figure 10.17 a- e), a), b) and c) show wear facets probably obtained through rubbing on a coarse surface, c) shows traces of rubbing on all surfaces including a concave interior possibly resulting from rubbing against a rounded surface or a grindstone; d) has shallow striations from contact with a coarse surface; and e) has fine “V-shaped” incisions on two surfaces (Barham, Simms, et al. 2000:185). A quartzite cobble discovered from the A Block by Clark in 1954, measuring 74 mm long, 57 mm wide and 40 mm thick, has use marks on the ends and yellow sediment (with a chemical signature similar to specularite (Barham 2005:4)) trapped between the quartz grains in the rock. This yellow sediment has also been found as a patch on the ground of the cave and on some artefacts found at the site (Barham 2002b:186). From the F Block, two pieces of specularite and one piece of haematite (2.45 % of the 122 ochre pieces) have been modified by rubbing (Barham 2002b:186; Barham, Simms, et al. 2000:Figure 10.20).

A report on the 1954 and 1956 excavations performed by J. D. Clark was published by Clark and Brown (2001). The report explains artefact assemblages from all the Blocks at Twin Rivers, and presents an additional 107 ochre pieces from the F Block (Clark and Brown 2001:314; Wadley 2005a:2). From the A, B and F Blocks rubbed crayons of limonite, haematite and manganese were found (Clark and Brown 2001:Fig. 20, no. 23 and 25). From the F Block, a quantity of pencils of haematite with rubbed facets was discovered (Clark and Brown 2001:310). They also mention a quartzite pestle stone with haematite staining still visible on the working surface (Clark and Brown 2001: Fig 20, no. 22).

Geochemical analyses of the soil at Twin Rivers show that the cave is rich in manganese and poor in iron, suggesting that the ochre minerals (except perhaps the manganese dioxide) were procured elsewhere and brought to the cave (Barham 2002b:184; 2005; Young 2000). Barham, Simms, et al. (2000:190) has estimated, by using the volume excavated from F Block by Clark in 1956 (120m<sup>3</sup>) and comparing this to the weight of ochre and volume excavated from F Block by Barham in 1999, that 56.7kg, or 29 792 pieces of

ochre was brought to this cave. By using the volume excavated from A Block by Clark in 1954 (4 – 5 m<sup>3</sup>) and comparing this to the weight of ochre and volume excavated from A Block by Barham in 1999, an estimated 11.2 – 12.6 kg, or 1440–1620 pieces were brought to this cave (Barham 2002b:186). However, these numbers should only be regarded as guidelines as this material is no longer available.

Even though a variety of colours of ochre were used at Twin Rivers (such as yellow, brown, red, a dark sparkly purple shade of red (specularite), pink, and blue-black) the most predominant colour at the site is red (Barham 2002b:Table 1; Watts 2009). Surface surveys of the hillside provided evidence of potential sources of haematite and limonite 2 km from the site (Barham 2002b:183). These outcrops may have been available during the MSA. Specularite has been found in thin veins and as cobbles along the Lusaka dolomite plateau 5 km north and west of Twin Rivers and in thick veins (5-8 cm) 22 km west of the cave. Ferruginous sandstone outcrops are also locally available, but no manganese dioxide sources have been found (Barham 2002b:183).

#### **4.2.2 Ochre material from Blombos Cave, Western Cape, South Africa**

In 2001, (Henshilwood, Sealy, et al.) reported a large amount of ochre from the Still Bay (see Appendix 3 for time-frame) levels at Blombos Cave (BBC) in South Africa (see table 2). The find consists of 8224 pieces, or 5831 g (7914 pieces or 5704 g of pigmentous ochre) of ochreous material. 81.7% of the ochre material is <10 mm maximum dimension, but this only accounts for 6.6% of the total ochre weight. As a result, Henshilwood, Sealy, et al. (2001:431) restricted their analysis to pieces >10 mm in length (1,534 pieces or 5,581 g).

All the excavated layers at Blombos Cave are divided into three major phases based on their stratigraphic location and composition:

“...an upper Still Bay phase named BBC 1; a middle MSA phase, BBC 2, and a lower phase, BBC 3. A phase is defined as a chronologically limited cultural unit within a local culture sequence. Each phase is made up of a number of different layers with similar diagnostic traits that sets it apart from other phases” (Henshilwood, Sealy, et al. 2001:425).



Phase	Density (mass)	% of total ochre material
BBC 3	2665 g per m <sup>3</sup> (shell-midden layer CI peaked 5500 g per m <sup>3</sup> )	78.6 % of pieces and 82 % of mass (Henshilwood, et al. 2009:30)
BBC 2	169 g per m <sup>3</sup>	
BBC 1	316.9 g per m <sup>3</sup>	

**Table 5: Ochre density in the different occupation phases at Blombos Cave, South Africa**

Pigment density in the different BBC phases (Table 5), shows that the amount of ochre collected in BBC 3 was almost 16 times that in BBC 2 and 8.4 times that in BBC 1. Of pieces >10mm, the relative frequency of ochre at BBC 3 is 40.7%, at least three times more than previously reported MSA or LSA values. This is an unusually large amount compared to other MSA sites (Henshilwood, Sealy, et al. 2001:431).

Fine-grained sedimentary forms (shales, siltstone, coarse siltstone and mudstone) of ochre are more predominant than sandstone and haematite in BBC 3 when compared to the later BBC 2 and BBC 1 phases. The siltstone is fairly soft (2-3 on Mohs hardness scale – see Appendix 4) and is reddish-grey and reddish-brown in colour. “Haematite” (≥4 on Mohs) includes a range of iron rich (reddish) colours and are fairly hard forms of ochre. Most of the sandstone is fine-grained and haematitic (Henshilwood, et al. 2009:30).

307 pieces (20% of all >10 mm pieces, 61.6% by mass) show definite signs of modification (Henshilwood, et al. 2009:Table 2) in the form of striations from grinding (62.5% of these pieces), or scraping (43.9%) (for description of grinding and scraping traces, see Henshilwood, Sealy et al. (2001:432)). 9.4 % showed traces of both scraping and grinding. Ochre residue has been found on a number of lithics and shells, as well as on grindstones (Henshilwood, et al. 2009:30-38), suggesting that ochre was ground at the site (Watts 2002:8). Almost double the percentage of pieces are utilised in BBC 1 (33.1 %, 246 pieces) as in BBC 3 (17 %, 1117 pieces) (Henshilwood, et al. 2009:30). The result of such modification is evident through scraped ochre tablets (mostly confined to BBC 3) and ochre pieces which had been intensively ground, with a similar shape to “crayons” (modified pieces with multiple facets) (Henshilwood, d'Errico, et al. 2001; Henshilwood, Sealy, et al. 2001:422, 432).

Hardness of the ochre seems to have been the main factor influencing the probability of an ochre piece being ground rather than scraped. Softer pieces are less likely to be iron enriched and as a consequence, scraped pieces consist more often of lighter non-saturated nuances and yellowish hues than ground pieces (Henshilwood, et al. 2009:30). Twelve definite and 12 probable crayons were retrieved. In BBC 1, 12.8% of all modified pieces were crayons which mostly consisted of fine sandstones and haematite, whereas in BBC 3, only 5.4% of modified pieces were crayons consisting of fine-grained sedimentary forms. Utilized pieces of both fine-grained sedimentary forms and haematite have a higher mean weight than its unutilized counterparts, indicating that the unutilized pieces represent mainly small processing debris (Henshilwood, Sealy, et al. 2001:432).



**Figure 8: The two (A+B, and C+D) engraved ochre pieces, Still Bay points and ochre stained bone awls from Blombos Cave, South Africa. Illustration by Henshilwood, et al. (2002:1279) and University of Witwatersrand (2010)**

Among these ochre pieces, two geometrically engraved ochre slabs were recovered from BBC 1 levels, dated to  $77 \pm 6$  ka by thermoluminescence of burnt lithics in the same layer (Henshilwood, Sealy, et al. 2001:426; Henshilwood, et al. 2002:1278). They were both found in close proximity to hearths. On both pieces, traces of modifications in the form of grinding and scraping on the flat surfaces and the edges have been identified. In addition, a cross-hatched pattern of similar designs is apparent on one larger flat surface on both pieces, one of them with fewer lines than the other (Figure 8). Later, thirteen additional, though less obvious, incised pieces of ochre from c. 100 - 75 ka layers at BBC have been reported (Henshilwood, et al. 2009). In addition, ochre has been found incorporated into the polish of eight bone awls (Figure 8) (d'Errico and Henshilwood 2007:148, 156; Henshilwood, d'Errico,

et al. 2001:642) and four *Nassarius kraussianus* shell beads (Figure 19) (Botha 2008:199; d'Errico, et al. 2005:17; Henshilwood, et al. 2004:404) from c. 75-70 ka layers.



Figure 9: Four *Nassarius kraussianus* shell beads from Blombos Cave, South Africa. Illustration by Henshilwood, et al. (2004:404)

Although the colour of the ochre varies (such as yellowish-brown, reddish brown and brownish-red) depending on hardness, the most frequently utilized pieces are red. The reddest, most saturated (the most haematitic) pieces are more likely to be utilized than fine-grained sedimentary forms and its less red counterparts (Henshilwood, Sealy, et al. 2001:433; Watts 2002:9). Almost 40 % of the most saturated red ochre's, where 44.8 % consist of sandstone and haematite, were utilized.

“The high proportion of “saturated reds and brownish reds” in the haematite sample, combined with their preferential utilization, permits the inference that haematite was the most highly esteemed form of pigment, because of its redness” (Henshilwood, Sealy, et al. 2001:433).

The varying amount of ochre and the difference in raw material use throughout the MSA layers at BBC suggest that the ochre material derive from several outcrops. The nearest Bokkeveld outcrops to BBC today are situated approximately 19 km east adjacent to the Goukou River and 21 km west along the coast close to the Duiwenhoks River (Henshilwood, et al. 2009:29). In BBC 3 levels, holes bored by marine bivalve molluscs on 6.3 % of the fine-grained sedimentary ochre pieces indicate that ochre from a sub-tidal substrate of the Bokkeveld Group was exploited during this period. As suggested by the percentage of utilized versus unutilized pieces, more ochre was brought into the cave than was likely to be used, suggesting that ochre was easily found and brought back to the cave. In BBC 2 and BBC 1, this Bokkeveld Group was covered by Waenhuiskrans Formation sands and became inaccessible (Henshilwood, Sealy, et al. 2001:432). Smaller quantities of ochre, larger pieces, more hematite-enriched material and higher percentage of utilization suggest that ochre

was exploited from sources farther from the cave in this period, perhaps from Bokkeveld Group outcrops 35-40 km away.

#### **4.2.3 Ochre material from Sibudu Cave, KwaZulu-Natal, South Africa**

Tammy Hodgskiss (2010:3345) reported 600 pieces of worked and approximately 8000 pieces of unworked ochre from Sibudu Cave. As the ochre material from Sibudu Cave had not yet been fully analyzed, the interpretations have been based on the 1200 pieces so far studied (Hodgskiss 2010:3352). Though these numbers are still not definitive, further analysis by Hodgskiss (Tammy Hodgskiss, personal communication 2011) has resulted in an ochre assemblage around 5500 pieces (when small “crumbs” are excluded), of which almost 700 are worked. The ochre material at Sibudu is represented by ground pieces, as red and yellow residue on coarse sandstone slabs/spalls and cemented hearths, as deposits on flake-platforms/butts, as residue on lithics, as patches of ground ochre powder and as unmodified fragments (Soriano, et al. 2009; Wadley 2010a:2399).

The trace elements in ochre used at Sibudu vary. The origin of the MSA ochre is therefore still unknown. Ochre at Sibudu Cave most likely derives from several outcrops, one of which might be the Ndwedwe shale quarry in the Pietermaritzburg Shale Formation approximately one kilometre downstream from Sibudu. The colour of the ochre is predominantly red, but shades of red, brown and yellow also occur. Ochre mostly consisting of haematite, goethite, dolerite and quartz seems to have been brought to the site (Wadley 2010a:2397, 2404). Although ochre is found at the lowermost Still Bay levels of Sibudu, the most ochre rich layers seem to be  $58.5 \pm 1.4$  ka where 471 ochre pieces were recovered from two excavated meter squares (Cochrane 2006:73; Wadley 2010a:2399).

The best analyzed feature of ochre use from MSA levels at Sibudu is ochre residue on lithics (such as points, scrapers, “other retouch”, flakes, backed segments and chunks) (e.g. Lombard 2005a; Lombard 2006a, b; Wadley 2005b; Wadley and Jacobs 2006; Wadley, et al. 2003; Williamson 2004). A total of 412 stone tools were examined using x 50 to x 800 magnifications under incident light by Williamson (2004:174). 51, or 11 %, of the stone tools show traces of ochre residue (Williamson 2004:Table 1), and these were more likely to be points (14 pieces) and “other retouch” (16 pieces) than other tools such as scrapers (8

pieces), flakes (7 pieces) and chunks (6 pieces). Some scrapers and points showed traces of thick ochre deposits on both the dorsal and ventral surface on the proximal end of the tool (Williamson 2004:Fig. 2 and 3.).

24 lithic points from post-Howiesons Poort levels at Sibudu Cave (  $64.7 \pm 1.9$  ka to  $61.7 \pm 1.5$  ka (Wadley 2008:122)) were microscopically analyzed by Lombard (2004:37; 2006a:59). The results show that ochre residue was present at the proximal end of most of the lithics (Lombard 2004:Table 5). In 2005, Lombard examined 50 unwashed bifacial and unifacial points and point fragments from  $61.5 \pm 2.2$  ka and  $51.8 \pm 2.1$  layers at Sibudu (Lombard 2004:37). The tests showed that ochre was present at the proximal end (63 %), medial part (77 %) and distal end of both the points and point fragments (Lombard 2005a:Fig. 5). 80.5 % of all ochre occurrences on these lithic points (~164 occurrences) are located on the proximal end and medial part of the tool (Lombard 2006a:Table 1). This is in accordance with other kinds of residue found on the lithics, such as plant tissue, animal fat, woody residue and resin (87 % of all the resin occurrences (~146 occurrences) are also located on the proximal and medial portions of the tool) (Lombard 2006a:Table 1). A Chi-square statistical test conducted by Lombard (2004) (see Lombard (2004:43) for explanation of Chi-square test) suggests that the distribution of both ochre and animal/plant residue on the lithics is not random, and chance is thus unlikely to explain their occurrence (Lombard 2005a:293).

An additional 53 Howiesons Poort backed segments were analyzed by Lombard (2006a:59). Soil samples from where these segments were recovered show little traces of ochre mixed with the soil, and ochre residue on lithics in these layers are thus unlikely to be accidental. On these segments, ochre (502 occurrences) and resin (585 occurrences) were clearly concentrated on the backed portions of the segments (Lombard 2006a:Table 2). 80 % of the ochre and 87 % of the resin was located on the backed portions (Lombard 2006a:Fig. 4), showing similar results as the 24 lithic points from the post-Howiesons Poort layers (Table 6). In addition, two of the 16 microlithic backed quartz tools from  $61.7 \pm 1.5$  -  $64.7 \pm 1.9$  ka layers studied by Lombard (2011:1926) showed signs of ochre.

<b>Residue/section</b>	<b>post-Howiesons Poort</b>	<b>Howiesons Poort</b>
Ochre occurrences on proximal end/backed portions	On 63 % of all lithics	On 80 % of all lithics
Ochre occurrences on medial part	On 77 % of all lithics	-
Resin occurrences on proximal end/backed portions	On 87 % of all lithics	On 87 % of all lithics
Resin occurrences on medial part	On 87 % of all lithics	-

**Table 6: Percentage of lithics with distribution of ochre and resin occurrences at Sibudu Cave, South Africa.**

Several ochre “crayons” from Sibudu have been examined by Wadley (2005a) using a x50 to x500 magnification microscope with incident light. Striations indicative of grinding run towards the tip of the “crayon” facets. None of the crayons however, show traces of use on the tip of the facet itself (Wadley 2005a:6). Through experiments, Wadley (Wadley 2005a:7, 8) has discovered that ochre pieces can sometimes end up in a similar shape to “crayons” if intensively ground.

“A nodule is most easily worked by rotating it so that several faces are ground and become faceted. After the hematite crust is ground to the point where the inner ironstone core is partly exposed on one face it becomes necessary to rotate the nodule and to grind another facet. Several facets are produced by rotating the nodule” (Wadley 2005a:5).

She concludes that such crayon-shaped ochre pieces simply are the accidental result of intensive grinding and/or rubbing depending on the original shape of the ground piece, and that this possibly was connected to ochre powder production for hafting. Arguably, ochre powder for hafting can be obtained through crushing ochre pieces with a hammerstone. Wadley (2005a:5) points out however, that only waxy ochre can be pulverised with a stone, and such ochre is absent at Sibudu Cave. In addition, “crayon” shaped ochre pieces are rare in comparison to other ground, striated and polished ochre pieces at Sibudu Cave. A ground ochre piece that shows traces of resin residue embedded in a flat facet of the piece, suggests that this piece was connected to the use of resin in some way (Wadley 2005a:7). A large

portion of the worked ochre material from Sibudu shows unequivocal evidence of grinding (Hodgskiss 2010:3352), and ochre with evidence of rubbing is well represented. A large number of these pieces appear to have undergone a combination of both rubbing and grinding (Tammy Hodgskiss, personal communication 2011). A few pieces have shown convincing evidence of smoothing, polish and external microstriations from rubbing. Signs of scoring are rare (Hodgskiss 2010:3352). Engraved and incised patterns like the ones reported from Blombos Cave have not been found (Hodgskiss 2010:3352).

Ochre powder has been found on four cemented crusts of white ash from *in situ* hearths from  $58.5 \pm 1.4$  ka layers at Sibudu Cave (Wadley 2010a:2397). Substantial deposits of both red, shades of red, and yellow ochre powder have been found connected to the crusts. The ochre powder occurs as patches ( $\pm 20$  cm diameter) on the edges of the cemented hearths, patches a short distance from the hearths and as a patch of thick red powdered ochre in the middle of one hearth (Wadley 2010a:Fig. 4). Coarse sandstone spalls with red and yellow ochre powder are also present in the cave. In addition, a piece of worked and polished ochre was associated with one of the crusted hearths. As Sibudu is the only MSA site which has yielded cemented hearths connected to ochre use, Wadley (2010a:2404) has argued that this practice might have been confined to Sibudu Cave. She has examined whether these cemented hearths could have worked as lower grindstones in the process for extracting ochre powder. Experimental grinding on both cemented hearths and coarse sandstone-spalls however, suggests that it might have been the sandstone-spalls rather than the cemented hearths that were used as work surfaces for ochre powder production (Wadley 2010a:2403).

A report by d'Errico, et al. (2008:2679) describes six *Afrolittorina africana* shells (three of which are perforated) from Sibudu Cave. One derived from the lowermost Howiesons Poort layers, three derived from the uppermost Still Bay layers and the reminding two derived from the lowermost Still Bay layer, indicating a collection between 80 and 60 ka. Two of the shells come from Still Bay layers and were discovered in hearths. The smaller of these is perforated, with indications of use/wear by heavy micro-chipping on the outer lip in addition to it being covered in red ochre residue, particularly in micro-pits on the shell's spire (d'Errico, et al. 2008:2679). Thus, the ochre record from Sibudu Cave is substantial in amount and present in many aspects of its MSA material record.

### **4.3 PRESENTATION OF THE OCHRE MATERIAL FROM THE FOUR SUPPLEMENTARY SITES**

The ochre material presented above derives from the three best documented sites reviewed in this analysis. Below follows four sites that will provide supplementary detail.

#### **4.3.1 Ochre material from the GnJh-15 site in the Kapthurin Formation, Kenya**

The ochre material from site GnJh-15 in the Kapthurin Formation in the Tugen Hills in Kenya Rift Valley, consist of >70 haematized pieces (>5 kg) of red ochre from an *in situ* context, ranging in size from granular powder (<3 kg) to larger pieces (>250g) (Deino and McBrearty 2002:208; McBrearty and Brooks 2000:528). The red haematized pieces of ochre however, are fragile and therefore do not show any signs of modification. In addition, the earth at the site is stained red, possibly due to ochre powder (Cornelissen, et al. 1990; McBrearty and Brooks 2000:528). More ochre, and ochre stained grindstones thought to have been used to process it, were found during excavations in 1997 (McBrearty 1999:152; McBrearty and Brooks 2000:528). The presence of volcanic minerals at this site allows for the application of  $^{40}\text{Ar}/^{39}\text{Ar}$  radiometric dating technique on tuffs and lavas, resulting in an age of  $543\pm4$  ka to  $284\pm12$  ka for the occupation period (Deino and McBrearty 2002:185; McBrearty 2001b:88; McBrearty and Brooks 2000:528). The red ochre is found immediately below the youngest layer. This ochre material still awaits descriptive analysis.

#### **4.3.2 Ochre material from site 8-B-11, Sai Island, Northern Sudan**

The site 8-B-11 at Sai Island, Northern Sudan has been an archaeological excavation scene since the 1950's (Van Peer, et al. 2003:2). An OSL-assessment of the overlying aeolian sands from the lowermost levels at the site, associated with an Acheulean industry, indicates a maximum age of  $223\pm19$  ka. Optical age determinations of the gully fill sediments have provided an approximate age for the whole occupation period, c. 220 until c. 150 ka (Van Peer, et al. 2003:1). The occupation levels are divided into Lower ( $223\pm19$  ka), Middle ( $182\pm20$  ka) and Upper ( $152\pm10$  ka) Sangoan (named after the Sangoan stone technology, including heavy duty picks, choppers, core axes and core scrapers of the Acheulian, believed



to exist at the site (McBrearty 1988:389)) due to their relative chronological position at the site (Tryon, et al. 2006:219; Van Peer, et al. 2003:6).

Fifty-nine predominantly yellow and red ochre (iron oxyhydroxide and iron oxide) lumps have been recovered from the Lower Sangoan levels of Mumbwa (d'Errico, Vanhaeren, Henshilwood, et al. 2009:Figure 1. d; Van Peer, et al. 2003:4; Van Peer and Vroomans 2004:Table 1). The ochre material mostly consists of small (<5mm) unworked lumps and some of these still show traces of the sandstone matrix from which they were extracted (Van Peer and Vroomans 2004:16). Only a few pieces from this layer show clear evidence of grinding or scraping in the form of striations and rubbing facets. As the ochre material from Sai Island still awaits a detailed examination, it is possible that several more of these ochre lumps have been processed (Van Peer and Vroomans 2004:16).

Several small elongated (<50mm) brown/red chert pebbles, not normally found in the gully fill, with yellow and red ochre staining in percussion marks on one of the faces have been recovered from the Lower Sangoan levels (Van Peer, et al. 2003:4; Van Peer and Vroomans 2004:16). One of the pebbles has a thick wear polish. Another has streaks of yellow and a red ochre spot on one of its flat faces (Van Peer, et al. 2003:4-5; Van Peer and Vroomans 2004:Figure 16). A fragment of a circular flat grinding stone (141 mm long and 34 mm thick) with carefully trimmed sides was recovered from the Lower Sangoan levels. A Nubian sandstone slab found in the same level, on which a large depression surrounded by smaller pits has been cut out, has been made perfectly flat by pecking (d'Errico, Vanhaeren, Henshilwood, et al. 2009:Figure 1. c; Van Peer, et al. 2003:Figure 17). Two such slabs with similar cut-out depressions are found in the Middle Sangoan level. These have not undergone the same extent of shaping however, as the slabs from the Lower Sangoan (Van Peer and Vroomans 2004:18).

Iron oxides are found in the local Nubian sandstone located near the site, and four outcrops which yield different ochre minerals that are known from present-day Sai (Van Peer and Vroomans 2004:16). Due to the easy availability of the ochre minerals, it is likely that the MSA occupants procured their ochre from local sources.

#### 4.3.3 Ochre material from Mumbwa Caves, Central Zambia

The excavations conducted by Lawrence Barham in 1993 and 1994 in the Mumbwa Caves follow a range of excavations on the site from 1925 to the 1970's (Barham 1995:66). The site is divided into units: I-XIV (roman numerals). Ochre has been recovered from layers III-XIII.

Unit	Dates
IV	c. 23 ka
V	39.6±7.6 ka
VI	c. 100 – 40 ka
VII	107±11 ka, 113±13, 120 ±12 ka, 130±6.2
VIII	170 – 130 ka
IX	172 ±22 ka
X	172 ±22 ka
XI, XII, XIII, XIV	>172 ka (could possibly extend to 255 ka)

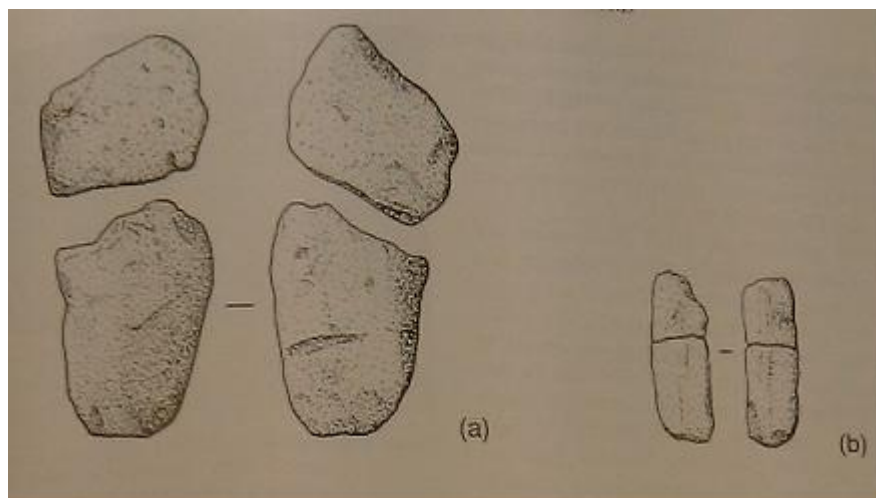
Table 7: Dates of layers IV-XIV at Mumbwa Caves, Zambia (Avery 2003:65; Barham and Debenham 2000)

The site is dated to >172 ka – c. 23 ka (Table 7). Ochre minerals brought to the site mostly consist of haematite, specularite, ferruginous sandstone, yellow sandstone and limonite (Barham 1998:709; Barham, Pinto, et al. 2000:83). One piece of manganese dioxide has also been recovered. This mineral could however, have been formed *in situ* as a concretion (Barham, Pinto, et al. 2000:84).

Unit	Haematite	Specularite	Sandstone	Limonite
III	1	4	9	
IV	3		3	
V	4	1	5	
VII	59	11	210	17
VIII		1	25	
IX			8	
X		1	34	
XI, XII, XIII,			41	2

**Table 8: Distribution in units of the different ochre minerals at Mumbwa Caves, Zambia**

In 1995, Barham reported blocks of haematite associated with hearths and structures (windbreaks (Barham 1995:69)) in MSA levels at Mumbwa Caves weighing 1 kg and over, some of which show evidence of grinding and scraping (Barham 1995:68). Another potential ochre source (Barham, Pinto, et al. 2000:84), ferruginous and yellow sandstones, is predominant in units III – XII, followed by iron oxides (haematite, 67 pieces and specularite, 18 pieces), and iron hydroxides (limonite, 19 pieces) (Table 8). Four pieces of iron oxide (4.16 % of the ochre material), all recovered from unit VII, have developed facets from rubbing and/or grinding, or are incised with “V” and “U” shaped lines and grooves varying in width from 1 to 3 mm, suggesting that both blunt and sharp-edged tools were used (Barham, Pinto, et al. 2000:84).



**Figure 10: Baked clay pieces from Mumbwa Caves, Zambia. Illustration by Barham, Pinto, et al. (2000:87)**

In addition, two pieces of baked (heat treated) clay with similar shapes to “crayons” (Figure 11) were found in unit VII (Barham, Pinto, et al. 2000:Figure 8.4).

Except for specularite sources, all the different raw materials discovered at the site are found within a radius of 15 km from the caves (Barham, Pinto, et al. 2000:84). Yellow sandstones is found 1 km from the caves and reddish sandstones is found locally (Barham, Pinto, et al. 2000:84). The local reddish sandstones release a red colour similar to soft haematite when soaked in water. Lateritic sources of haematite and limonite are also found in the sites near proximity. The limonite and yellow sandstone produces a similar bright yellow powder (Barham, Pinto, et al. 2000:84). Potential sources of specularite are found nearby in laterite deposits and quartz veins as well as in the Nambala Hills 18 km to the south of the caves. Of note, only two pieces of specularite at the site seem to stem from the Nambala outcrops and the local specularite is harder and allows for knapping or use as hammerstones, consistent with the presence of gouged, flaked and rubbed pieces of specularite and limonite found on the site (Barham 1998:709).

Ochre is by far the most abundant in Unit VII. Though there are masses of sandstones brought to the site, there seems to have been a low frequency of ochre procurement in the oldest occupation levels at Mumbwa (Barham, Pinto, et al. 2000:84). It is evident from Table 8 that the transport of iron oxides and hydroxides declined after Unit VII, although some ochre is still brought to the site (Barham, Pinto, et al. 2000:83). Unit IV, V and IX have not been properly excavated, and the number of ochre pieces found in these layers is probably not representative of the respective periods (Barham, Pinto, et al. 2000:82).

#### **4.3.4 Ochre material from Pinnacle Point Cave 13B, Western Cape, South Africa**

In 2007, Marean, et al. reported 57 pieces (0.934 kg) of ochre from  $164 \pm 12$  ka (later revised to  $162 \pm 5$  ka) layers at PP13B in South Africa, ten of which show definite signs of use by intensive grinding on one principal surface (8 pieces) and scraping (2 pieces) (Marean, et al. 2007:Fig. 2). Two additional pieces may have been modified by rubbing (Marean, et al. 2007:906). 46 of the reported pieces can be classified as iron rich fine-grained sedimentary “red ochre”, with colours ranging between intermediate reddish-brown (31 pieces), saturated reddish-brown (10 pieces) and saturated very red with 75 % redness (7 pieces) (Marean, et al. 2007:906). The modified pieces are mostly of saturated very-red values, suggesting that the reddest colours were preferred for utilization (Marean 2010:427, 436; Marean, et al. 2007:906).

In 2010, Watts analyzed ochre at PP13B from all three excavations at the site (for a detailed categorization of the material, see Watts (2010:397-400)). Ochre at PP13B is found in levels spanning c.164 – c.91 ka (d'Errico, Vanhaeren, Henshilwood, et al. 2009:21-22; Jerardino and Marean 2010:Table 1; Marean 2010:425; Marean, et al. 2007:906; Watts 2010:409). Fine-grained sedimentary forms are predominant in the oldest layers, whilst iron oxide and haematized forms are more abundant in the younger layers (Watts 2010:408). Watts (2010:397) has increased the number of pieces found at the cave to 1032. He refers to the ochre as cases where each case consist of individual or collective entries (Watts 2010:396).

The number of cases at PP13B is 643. The analysis of the ochre material was restricted to pieces >0.1g or >10 mm maximum width and >0.2g for collective entries, with an additional requirement for full descriptive details. Of these 467 cases, 22 were qualified as “non-pigment” (predominantly quartzite roof spall), 47 as “doubtful pigment” (predominantly roof spall) and 18 pieces were qualified as “possible” pigment (unique geological forms that accounts for 37 % of the total ochre-mass)(Watts 2010:397). Of the 18 pieces, three were utilized for purposes other than powder production (two flaked and one pressure release), one piece was not ideal for pulverization, 11 were yellow and eight were not ideal for colouring purposes (Watts 2010:387). Therefore, the number of analyzed ochre from PP13B is restricted to 380 cases (d'Errico, Vanhaeren, Henshilwood, et al. 2009:22; Marean 2010:436; Watts 2010:387). Of these, 166 were discovered in the western excavation area, 163 in the eastern and 50 in the excavated area northeast in the cave (Figure 11) (Watts 2010:398)

Arranged according to mass, the ochre minerals present at the site consist of fine sandstone, iron oxide, coarse siltstone, siltstone and shale (Watts 2010:Table 3). Pieces >5mm in maximum dimension consist mostly of coarse siltstone, fine sandstone and iron oxide (Watts 2010:397). Among the iron oxides and sandstone, hardness  $\geq 4$  on Mohs scale predominates, whilst 60 % of the fine-grained sedimentary forms have hardness 3. Shale and siltstone are found within the cave in a very fragmentary manner and have the lowest mean weight of the ochre minerals. Of harder forms of shale and siltstone 60.6 % (66 pieces) of the harder pieces consist of haematized or moderately haematized forms, whilst only 15 % (100 pieces) of the softer pieces share those characteristics (Watts 2010:398).

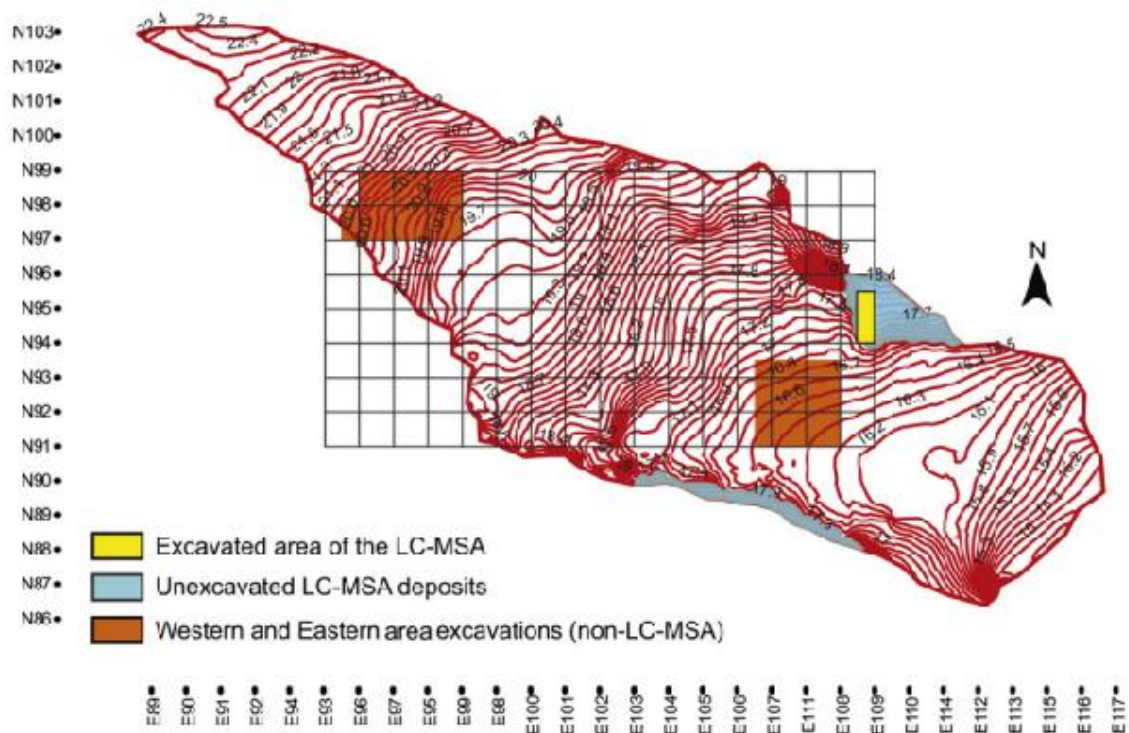


Figure 11: Map of the Pinnacle Point 13B site, South Africa. Illustration by Marean, et al. (2007:906)

LC-MCA = (Lightly Cemented Middle Stone Age) North-eastern area

Of the 380 cases analyzed by Watts (2010:402), 12.7 % (51.2 % by mass) show definite signs of modification. This accounts for 48 pieces with a mean weight of 10.7g (in proportion to the 310 unmodified pieces with an average weight of 1.4g). Six pieces have signs of scraping (predominant), flaking and notching (Watts 2010:396). Small debris accounts for the great majority of the material. The number of utilized pieces according to percentage in the north-eastern excavated area is twice that in the eastern, and ¼ as frequent as in the western area (Watts 2010:403). By weight, the frequency of utilized pieces is highest in the western area (58.3%), followed by the north-eastern (49.6 %) and the eastern (43.0 %). This could suggest that ochre was less utilized in the eastern part of the cave. Although no grindstones have been reported, 93.7 % (42 pieces) of all the modified pieces were ground (Table 9) and ten of these showed signs of being complete or nearly complete (Watts 2010:403).

Grinding level	Number of pieces	Percentage
Intensively ground	5	11.9 %
Moderately ground	22	52.4 %
Lightly ground	9	21.4 %
Other modification	6	14.3 %

**Table 9: Amount and percentage of the different levels of grinding on the 42 ground ochre pieces from Pinnacle Point 13B, South Africa (Watts 2010:405-406).**

Three pieces showed no signs of grinding. In addition, there were 14 probable and 5 possible ground pieces, together with 1 probable and 2 possible scraped pieces. One of the utilized pieces is a c. 100 ka old ground haematized mudstone chunk with multiple (14) facets and two scraped striations on one of the facets (Marean 2010:437; Watts 2010:408). The low frequency of scraping in proportion to grinding is probably due to a predominance of hard materials (>3 on Mohs scale). There are no obvious examples of “crayons” at PP13B (Watts 2010:405).

Watts (2010:403) decided to group definitely and probably utilized pieces as well as shale/siltstone because of the small sample of utilized pieces of the different ochre mineral categories and the indistinguishable average streak properties of shale and siltstone. Thus, the percentage of modified pieces increased from 12.7 to 14.6, and the number of utilized pieces from 48 to 63.

Ochre Mineral	Total number of pieces	Utilized (%)
Shale/Siltstone	166	12.7 %
Fine sandstone	55	16.4 %
Coarse siltstone	65	21.5 %
Iron oxide	59	25.4 %

**Table 10: Percentage of utilization of the total number of pieces of the different ochre minerals at Pinnacle Point 13B, South Africa**

As iron oxide is both harder and redder than coarse siltstone, fine sandstone and shale/siltstone (in that order), it is evident from Table 10 that harder and more saturated red pieces were preferred for utilization (Watts 2010:403). The consistent utilization of red nuances, together with no indication of “light/warm” or “dark/cool” colour-use at PP13B, has led Watts (2010:409) to conclude that there is nothing on the site supporting the BCT theory.

Ochre mineral	Accounts for X% of streak colour of utilized pieces
Shale/Siltstone	52.4 % of all reddish-browns
Coarse siltstone	20 % of very dark intermediate nuances (in proportion to shale/siltstone)
Fine sandstone	55.6 % of all saturated reddish-browns
Iron Oxide	90.0 % of all very dark, saturated and/or very red

**Table 11: Percentage of predominant colour for the different ochre minerals at Pinnacle Point 13B, South Africa**

According to percentage of utilized ochre minerals, very red (predominantly saturated) or very dark ( $\geq 60$  % redness) pigments were more likely to be utilized than their less red and/or dark counterparts, followed by saturated reddish-brown and intermediate reddish-brown (Watts 2010:404). Three of six pieces with 70 % blackness from post-100 ka layers were also utilized. Compared to unutilized pieces, where 40.7 % of the assemblage is saturated, very red and very dark, 80 % of the utilized pieces show the same properties. Ochre with very dark nuances was recovered near hearths, suggesting that it may have been exposed to heat (Marean 2010; Watts 2010:393). Although the reddest pieces are more likely to be utilized (Table 10) and iron oxide consist of 90 % of all very dark, saturated and/or very red pieces (Table 11), iron oxide only accounts for two of the 15  $>10$ g definitely and probably modified pieces, compared to five of the eight unutilized  $>10$ g ochre oxide pieces (Watts 2010:403). Only two of the 63 (definitely and probably) utilized pieces however, had less than 60 % redness. Also, pieces  $>1$ g were redder, darker and more chromatic than pieces  $<0.5$ g (Watts 2010:403). The hue variance among utilized ochre pieces is considerably lower than among unutilized pieces (Watts 2010:403). As smaller iron oxide pieces seem to have been selected



for utilization over the larger ones, the utilized pieces might show signs of colour selection. This colour selection gets more pronounced when “possible” utilized pieces are taken into account (Watts 2010:404).

A c. 1 km wide remnant of Bokkeveld Group siltstone and shale has been discovered by Marean, et al. around 5 km north of PP13B (Marean 2010:436; Watts 2010:409). A brief search of the 5.5 km long valley resulted in discovery of small amounts of widely distributed iron enriched shale/siltstone, of which samples proved to be similar to minerals found in the cave. In addition, a large Bokkeveld Group outcrop about 60 km of the cave, with both red and yellow ochre, could potentially have been used as no distinctly yellow ochre or ochreous sandstone have been found within 10 km of the cave (Watts 2010:396-397).



## 5. DISCUSSION – A RITUAL CONTEXT?

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Ethnographic sources, experiments and the archaeological record have provided evidence of utilitarian use of ochre (see Chapter 2). This is supported by the different forms of ochre reported from MSA sites, such as ground ochre and ochre powder, which are expected signs of such utilitarian use (see Chapter 1). It is therefore assumed that red ochre had at least one, if not several, utilitarian functions during the MSA. In addition, as outlined in Chapter 2, there are signs of ritual use of ochre, which would be expected to leave similar traces in the archaeological record. This has resulted in a discussion about the role of MSA ochre. This discussion has intensified the last decade and arguments therefore tend to focus on either a utilitarian or ritual use, however these are not necessarily opposites. Although a ritual interpretation of ochre has been proposed before, theoretical material-analysis investigating the ritual use of ochre has only been applied to a few sites and is generally absent at sites with evidence for utilitarian use (see page 19). Conversely, interpretations of utilitarian use have mainly been on sites where material analysis for ritual use is generally absent (such as Sibudu Cave, Umhlatuzana Rock Shelter and Rose Cottage Cave). As a result, the analyses and interpretations of ochre use have also been segregated by localities, thus diminishing the chances of obtaining the whole ochre picture. To avoid this problem, the selected sites have been chosen regardless of earlier interpretations of ochre at the respective localities.

Although red ochre occurs in different nuances at MSA sites, it is still reported as red. The colour-nuances of ochre will not be discussed further as this analysis is conducted on published literature concerning ochre and not first-hand experience.

### 5.1 TWIN RIVERS, CENTRAL ZAMBIA

Expanding on Chase's (1991) criteria's and characteristics of prehistoric ritual, Barham (2002b:188) has suggested that composite and heavy-duty tools must be present together with intensive ochre utilization for ritual behaviour to be implied. He states that as these features are present at Twin Rivers, its MSA occupants participated in ritual activities,

including body-paint, a feature he believes implies a sense of personal and /or group identity central for ritualized behaviour (Barham 2005:4). However, as a more specialized technology does imply social change, it cannot be directly connected to ritual behaviour. Also, although it is possible that ritual symbols were painted with red ochre on the bodies of ritual performers, the material at Twin Rivers does not include any abstract signs or symbols that would imply ritual display. By using the characteristics for ritual activity outlined in Chapter 3 however, it may be possible to infer that ritual activity occurred at Twin Rivers by solely looking at its ochre material.

The total number of recovered ochre pieces from the excavations conducted by Barham at Twin Rivers, including small flaking debris, is 1194. Only 302 of these have been properly analyzed. Of these, more than 90% consist of what Barham describes as red pigment/ochre. The additional 67.9 – 69.3 kg of ochre estimated to have been brought into the cave could bear witness to a long and extensive ochre industry at Twin Rivers.

Many small flaking debris of haematite suggests that this was a preferred mineral during the MSA at Twin Rivers. However, although high in number (32.45% of the 302 pieces), haematite occurrences at Twin Rivers by mass are only 3.15% of the 1.617 kg discovered by Barham. In comparison, specularite comprises 55.96 % of the pieces and 87.85% of the mass. The preponderance of specularite amongst the recently excavated material suggest that this was the most highly esteemed material, possibly because of its dark, sparkly, purple shade of red. This colour choice seems to have been consistent throughout the occupation periods in both the A- (400 - 266 ka) and F-Block (200 - 140ka), which indicates a repetitive, invariable and redundant use. The dates provided for the occupation period at Twin Rivers span over a very long period of time however (194,000 years of occupation, but no further specifics), and the material extracted from the site is scarce compared to the estimates. It is therefore difficult to know whether people were living there continuously, or if the site was occupied at several separate intervals. If the site was continuously occupied, then only <0.36g of ochre was collected each year if we consider the <70 kg estimate to be true. Taking into account the constant collection and utilization of the same materials and the same colour, it is likely that this ochre was collected for a specific purpose. This in turn makes it unlikely that the cave was continuously occupied as one would then expect more than 0.36g of ochre to be collected each year. It is therefore assumed that

Twin Rivers was occupied at several separate times, probably separated by many thousands of years. We must also remember that the large amount of ochre at Twin Rivers only represents the remnants, and that the initial ochre assemblage probably was considerably larger. The consistent choice of material and colour in all occupation layers at the cave therefore indicates that the people living there participated in an ochre industry. It also appears that this industry did not change in any noteworthy sense during this long period of time, resulting in similar signs of preference and utilization at Twin Rivers between 400-266 ka, and 200-140 ka.

Based on the number of specularite and haematite pieces recovered from Twin Rivers, red ochre is clearly a preferred material during occupation of both the A- and F-Block. The preference for red hues is also evident amongst the ten modified pieces found at the site. All pieces consist of specularite, except one haematite piece. In addition, a quantity of haematite “pencils” with rubbed facets, and a haematite stained hammer-stone are reported by Clark and Brown (2001:321), together with ochre “crayons” of haematite, limonite and manganese dioxide. Although the modified ochre pieces are small in number, signs (scraping, rubbing, and grinding) and preference (colour and hardness) for modification are still visible. What is unusual among these modified pieces is the scraped broken fragment of specularite from A-Block (Barham, Simms, et al. 2000:Figure 10.17, e). Scraping hard ochre would be energy-consuming work and would hardly produce any powder (Wadley 2005a:5; Watts 2009:73). Still, the piece is intensively scraped on both sides, but with no apparent pattern or design to suggest a similar context of use as the engraved Blombos ochre. The striations appear to move in only one direction, which could suggest that the piece was rubbed against a coarse surface which would have given it fine incisions and produced a larger amount of ochre powder. Without the missing part of the piece, however, it is difficult to reach any conclusions concerning its purpose. We can only assume that it was utilized to produce ochre powder as the rest of the modified pieces at Twin Rivers probably were.

Barham (2002b:181) has interpreted the collection, transport and processing of all the different ochres at Twin Rivers as evidence of intentional and repetitive use by the MSA people living there. Because specularite is a hard stone (5 on Mohs scale), it can only be processed by rubbing, grinding or scraping to produce a powder. Mellars (2005:17) has

argued that ochre pieces with smoothed, faceted and scraped surfaces, such as those found at Twin Rivers, implies their use as a pigmentous colouring agent. Although rubbing and grinding, as well as ochred grindstones suggest an ochre powder production, the powder could have served many different purposes (such as medicine or protection against the elements), only one of which might have been as a colouring-agent. Soft haematite and limonite occur in local outcrops, which is significantly easier to collect and process than specularite. It is therefore likely that ochre used for utilitarian purposes that did not necessarily require a specific colour or geological mineral, did not consist of hard specularite, but rather soft, accessible haematite and limonite. Also, if ochre was used for protection against the elements, then large amounts of powder would be required for each use. Although this is consistent with the large ochre record at Twin Rivers, it is at odds with the most commonly found ochre, specularite. It is unlikely that specularite was used for this purpose as obtaining enough powder to cover a body from specularite would take too much time and energy to be effective and therefore little point to the process. This suggests that specularite was collected for another purpose. For example, for pigments to be effective as medicine or for hide processing, they need to contain accessible iron. Ferruginous sandstones must be soaked in water to yield iron and colour, and manganese dioxide does not contain iron. It is therefore likely that the pigments at Twin Rivers do not reflect a solely functional use and that their collectors were aware of the different properties of the ochre minerals.

As more than 10 % of the ochre material at Twin Rivers consists of minerals other than specularite and haematite (of which 7.2% in the A Block and 3.3 % in the F-Block consists of yellow limonite) the Twin Rivers' occupants seem to have deliberately collected different kinds of ochre. This could suggest that the different kinds of ochre had different purposes. Outcrops of all the different types of ochre found at Twin Rivers are present within 5 km of the site, as a result it is difficult to say whether their procurement can be considered time consuming. If we assume that Twin Rivers was not continuously occupied, then the enormous amount of ochre material found at the site would surely demand a high cost in energy to obtain. In addition, thicker veins of specularite are found 22 km west of the cave, which would demand more time and energy to collect than the local source. Based on the predominance of specularite at the site, it is possible that this source was exploited. This

is consistent with the costly signalling theory as long-distance procurement would be expected for ochre used in rituals when local ochre was of poor quality or not available. The ochre procurement at Twin Rivers might therefore be seen as effortful behaviour, diverting both time and energy from other necessary tasks such as hunting and food processing. Ochre collection is therefore considered to be a costly activity at Twin Rivers.

Based on the antiquity of the collection and processing of red ochre at Twin Rivers, several researchers (Barham 2002b:189; e.g. Cruz-Uribe, et al. 2003; d'Errico 2003:10; d'Errico, et al. 2003:4; d'Errico, Vanhaeren, Henshilwood, et al. 2009:25; Taçon 2006; Wadley 2010b:118) believe ochre and colour use is a MSA phenomenon, with roots going back as far as the lower layers at Twin Rivers, the Late Acheulean. The high frequency of red ochre use in the occupied levels at Twin Rivers indicate that the collection, processing and use of ochre was public knowledge, suggesting repetitive and invariable behaviour, resulting in the evident redundancy and high amplitude of this ochre material. If ritual behaviour was developed by the time red ochre processing was present at Twin Rivers, then ritualized behaviour emerged before the development of AMH (Barham 1998:709; 2005:4; d'Errico, et al. 2003:4; Wadley 2005b:2).

### **5.1.1 Summary:**

Although a large portion of the ochre material from Twin Rivers has never been reported, the enormous amount ochre material estimated to have been brought into the site is strongly suggestive of an ochre tradition including repetition, redundancy, high amplitude and invariability. The relatively small number of modified pieces show traces of intensive utilization in the form of ground and rubbed “pencils” and “crayons” of hard ochre minerals, such as specularite and haematite. Procurement of this large assemblage would require a certain degree of planning. Modification of such hard ochres would demand both time and energy, as even intensive rubbing/grinding would only produce a small amount of powder, resulting in reduced time and energy for other necessary activities such as hunting and food processing. This makes ochre procurement and processing at Twin Rivers appear to be a costly behaviour. The ochre itself is also considered costly as pieces thought to be complete

or nearly complete would have had to have been processed through several episodes of use. This indicates that these were kept safe and perhaps considered to be especially or ideally suited for ochre processing at the site.

Although the preference for dark, sparkly, purple shades of red at Twin Rivers differs slightly from colour preferences at other MSA ochre sites, red hues are clearly the preferred colour at Twin Rivers as these are predominant amongst both utilized and unutilized ochre. The consistency in colour choice throughout the MSA occupation period, both amongst utilized and unutilized pieces, is evidence of redundancy and indicates a repetitive and invariable behaviour with high amplitude. Although there are no clear signs of indexical display, it is possible that ochre powder was used as body-paint at Twin Rivers. Even if there is a possibility that the small portion of the ochre material recovered from Twin Rivers is not representative of the rest of the enormous amount of material, there is sufficient evidence of ochre use at Twin Rivers to suggest ritual activity.

## **5.2 BLOMBOS CAVE, WESTERN CAPE, SOUTH AFRICA**

The amount of ochre found at BBC, indicates that ochre was an important feature during the MSA occupation-period of the cave. Although the concentration of ochre is by far highest in the lower-most phase (BBC3), the quality and size of ochre brought to the cave in BBC2 and BBC1 is generally higher. This could be explained by the nearby Bokkeveld Group outcrop being submerged around 100 ka, which would force the BBC occupants to procure their ochre from sources c. 19-21 km away if they wanted similar material. However, the more haematite enriched red, very red and saturated red ochre found at Blombos from BBC2 and BBC1, indicate that ochre was most often obtained from Bokkeveld Group outcrops 35-40 km inland (Henshilwood, et al. 2009:29), making the effort of procurement greater which would suggest that the colour and quality were more important than the quantity obtained.

This is supported by the amount of utilized ochre pieces recorded from the three phases. 20% of the 1,534 analyzed ochre pieces (c. 307 pieces, 61.6 % by mass) are utilized, suggesting that this was an important activity at Blombos. Among the 307 utilized pieces,



red, very red and saturated red are predominant. This is true even in the BBC3 level. The consistency in colour and mineral choice might give an indication as to why the BBC occupants went to such trouble in procuring red ochre from Bokkeveld outcrops 35-40 km away, when it would be a lot easier to procure lower quality ochre from sources c. 20 km away from the cave. During BBC2 and BBC1, the closest ochre outcrops could therefore have been ignored in favour of ochre considered to be of higher quality.

Judging by the recurrent colour and consistency of the utilized ochre pieces at Blombos, the preferential choice of raw material seems to have been constant. 40 % of these consist of the most saturated red ochre, suggesting that this colour, and similar hues, was the most highly esteemed. During BBC3, when local ochre was a lighter red and saturated, extensive compact hearths and ash deposits surround the dense ochre material (Henshilwood, Sealy, et al. 2001:426). This could suggest that ochre was deliberately or unintentionally altered, resulting in similar hues for the utilized ochre pieces as in the following BBC phases. Alternatively, if ochre was not heat-altered during BBC3, the relative low percentage of utilized ochre in this phase could be due to scarce availability of the most desired ochre minerals. However, as ochre has been discovered near hearths in all BBC phases, and some of the utilized ochre pieces have been reported as having very dark values, deliberate heat alteration of ochre at BBC is possible.

As the reddest, most haematized enriched ochre pieces are relatively hard, ochre powder extraction would only be effective if the ochre was ground. That 62.5 % of the utilized pieces show definite signs of grinding striations supports the preference for red haematized enriched ochre. As shown by experimental grinding by Wadley (2005a:5), the amount of powder produced by grinding hard haematized ochre is small. 80% of the utilized pieces have been judged to be  $\geq 90\%$  complete, ranging in size from 1.5 - 2.5 cm. This would suggest that pieces that met the standards of the most highly esteemed materials and colour would be kept and reused until it was too difficult to extract more powder from them. 11 of the completely used pieces were only lightly utilized. Although they consisted of saturated red ochre, which would make them desirable in accordance to the general colour preference, their smaller size might suggest that these were already too small to serve prolonged purposes.

Procuring and processing of these ochres implies a costly procedure. It has been suggested that the ochre was collected for its ability to pulverise and be used as earth pigment, most notable for body-paint in ritual activity (d'Errico, et al. 2001:317; Henshilwood, Sealy, et al. 2001:445; Henshilwood, et al. 2009:29; Henshilwood, et al. 2002:1278; Marean, et al. 2007:907; Watts 2002:1; 2009:82; 2010:392). Watts (2009:90) believes that the tiny amount of powder produced from processing hard haematized ochre is insufficient for anything other than making designs on the human body or other organic surfaces, such as ochre incorporated into the polish of shell beads and incised/engraved bone awls. Ochre on beads could be evidence of the ritual aspects of ochre as beads have no apparent practical function, and thus are one of the clearest ritual objects from the MSA. However, far from all the beads recovered at Blombos have traces of ochre and the circumstances in which the ochre has been transferred to the beads are unclear. It is possible that ochre residue on beads is the result of accidental staining. Also, although colouring pigment possibly is one of the functions for ochre powder and lithics with ochre connected to hafting has not been recovered from BBC, the amount of ochre acquired from grinding of such hard pieces is also consistent with the amount needed for manufacturing adhesives for hafting (Wadley 2005b:6). Thus, we cannot infer the ochre's purpose by solely looking at the utilized ochre material.

The 43.9% of the utilized ochre pieces that show signs of scraping mostly consist of softer ochre pieces with pastel and/or yellowish nuances. This is reflected in the 13 incised ochre pieces from c. 100 – c.75 ka layers at BBC. The fact that the reddest most saturated colours seem to have been preferred in ochre powder production makes it unlikely that these incisions were made for the purpose of extracting ochre powder. Also, such incisions/engravings would only produce a tiny amount of powder. As pieces that are soft enough to be scraped also would be soft enough to be crushed, a much more effective way of obtaining ochre powder, such markings would not be a likely means for ochre powder production. This is also true for the two geometrically engraved ochre pieces first reported by Henshilwood, et al. (2002). These were found in the near proximity of hearths and consist of redder ochre than the 13 incised pieces. They also show clear signs of striations from grinding, suggesting that they were utilised before they were engraved. This might imply that these pieces were kept safe for some specific purpose.

Based on a general consensus regarding the “modernity” of abstract or depictional images (Bahn and Vertut 1997:191-193; Henshilwood, et al. 2002:1279; Marshack 1996; Stoliar 1977), the cross-hatched pattern on these ochre slabs has been interpreted by Henshilwood, et al. (2002:1279) as deliberate meaningful representations and signs of social and stylistic elaboration incorporated into a system of symbolic intent and tradition. Because the engraved abstract patterns on both pieces are very similar, and the two engraved pieces resemble the patterns made on the 13 incised pieces (Henshilwood, et al. 2009:Figure 5) and those found on an engraved ochre piece from Howiesons Poort/post-Howiesons Poort layers at Klein Kliphuis, South Africa (Mackay and Welz 2008:Fig. 5 and 7), it is unlikely that the markings are unintentional. Watts (2009:90) has argued that the engraved pieces, together with the consistency in ochre procurement and utilization at Blombos Cave, indicate that saturated red earth pigments were used to paint abstract designs on the bodies of ritual performers even in the oldest ochre-bearing layers at Blombos, 143 ka. He states that *“It is almost inconceivable that the MSA occupants of Blombos were engraving such designs onto pieces of ochre while not doing similar things with ground ochre powder on their bodies”*. However, even if ochre powder was used for body-paint around 143 ka, it is problematic to infer the use of similar designs and intent as designs found on ochre pieces in layers half that age. It is possible, as predicted by Durkheim (1912 [1969]), that the engraved pieces resemble geometric designs painted in red ochre on the bodies of ritual performers corresponding to the layers in which they are found. However, we cannot be certain of the purpose of these engravings. All we know is that they have no apparent utilitarian function, they were most likely made intentionally, and they correspond to the introduction of beads and a more repetitive and invariable use of redder more saturated ochre. This could indicate that these engraved ochre pieces are connected to ritual activity.

### **5.2.1 Summary**

Based on the distance to the higher quality ochre outcrops, time and energy were set aside for planning and collecting ochre during BBC2 and BBC1. This would in turn take time and energy from hunting and other necessary day-to-day activities. Such time- and energy-absorbing procurement for the higher quality materials suggests that ochre itself was considered costly by the MSA Blombos occupants. If ochre powder was used for body paint

in ritual activity, then the ochre colour would probably be as important as the designs themselves, which would also explain the effort used to obtain the reddest, most saturated hues. The large amount, together with the evident preference for the reddest, most saturated ochre pieces and the consistency of colour choice for the utilized pieces during the MSA at Blombos Cave, is evidence of repetitive behaviour, as well as invariability, high amplitude and redundancy. The repetitive evidence of procurement, processing and use of the most saturated reds throughout the occupation period, are also indicative of sequencing. The large amount and consistent colour choice could also be evidence of exaggerated formality which would be expected to leave loud visible signs. Since the reason for exaggerated behaviour is to project something extraordinary (Alcorta and Sosis 2010:523), then vast use of a distinctive ochre colour might be considered exaggerated. Also, the engraved ochre slabs from Blombos could represent such exaggerated behaviour as these would indeed be considered extraordinary. The incorporation of shell beads into this system of ochre use show how extensive the tradition is. Seen together, these characteristics meet all the demands of both Watts' (2009) and Sosis and Alcorta's (2003) lists and imply that ritual behaviour are present throughout the MSA occupation at Blombos, right down to the oldest ochre bearing layers (c. 143 - 70 ka).

### **5.3 SIBUDU CAVE, KWAZULU-NATAL, SOUTH AFRICA**

The ochre from c. 77 – 50 ka layers at Sibudu Cave has most frequently been associated with a utilitarian industry of composite hafted tools (ochre in hafting will be discussed further in Chapter 5.8). The ochre material at Sibudu does however reach far beyond the limits of ochre in adhesives for hafting. Of c. 5500 pieces of ochreous material, 700 show signs of modification. Judging from the relative short MSA occupation period at Sibudu, the ochre record is particularly large in proportion to sites such as Blombos where the record is of a similar size, but distributed over a much longer period of time (c. 143 – 70 ka). As we do not know whether Blombos or Sibudu was continually occupied, this could simply mean that Sibudu was more frequently occupied during this period of time, resulting in larger quantities of ochre. If Sibudu was continually occupied, then only c. 0.2 pieces of ochre was collected each year. This is at odds with the consistency in material collected, utilization

methods and colour preference seen at the site. It is also at odds with the hafting hypothesis as it is hard to imagine that only a few lithics would have been hafted each year. Then we would have expected the recipe and the hafting method to have been less consistent than what is seen at Sibudu. It is therefore assumed that the occupation at Sibudu was not constant, but occurred in stages.

Although yellow ochre occurs, red is by far the most frequently collected and utilized colour at Sibudu. This suggests that the Sibudu occupants were participating in an ochre industry focused on red hues. The large portion of ground and/or rubbed ochres, together with ochred sandstone-spalls and ochre deposits found associated with crusted hearths, indicates that ochre powder production was an important activity at Sibudu. All utilization traces found at Sibudu indicate that ochre powder, and not the ochre pieces themselves, was the desired product. The ochre patches near the hearths, as well as the large amount of utilized pieces found at the site, suggest that ochre powder production was done *in situ*. The modified ochre pieces at Sibudu are found in many shapes and sizes, amongst them the debated ochre “crayons”. Ochre “crayons” from Sibudu have been analyzed to challenge the assumption that these had the same function as their name implies. Wadley (2005a:6) has examined the Sibudu “crayons” and discovered that the tip of the faceted pieces do not show any indication of ever being used. It is therefore assumed that the shape of the “crayons” is accidental and has nothing to do with what the name implies. As waxy ochre suitable for crushing is absent at Sibudu, evidently all the ochre powder at Sibudu seems to have been produced from rubbing or grinding, suggesting that the “same” ochre powder was used for different purposes, thus indicating a possible connection between its functions. Coarse sandstone-spalls with red and yellow ochre residue, and large deposits of red and yellow ochre powder connected to cemented harts, bear witness to this extensive industry.

As shown in experimental studies by Wadley (2010a:2403), the cemented hearths were not ideal for processing ochre powder. Still, there are large deposits of ochre powder associated with these cemented hearths, which could indicate that they worked as containers for the finished-ground ochre powder. This could suggest that the powder was considered costly and kept safe for future use. However, if this was the case, then both red and yellow ochre powder was kept. One possibility is that yellow ochre was brought into the cave for the purpose of undergo colour-alteration using heat from the hearths. However, as

ochre changes colour in heat as low as 250 °C (from yellow to red, or from iron oxyhydroxide to hematite)(Wadley 2010a:2403), it is more likely that the yellow ochre was applied after the hearth was cold. It is therefore unlikely, at least in this case, that yellow ochre at Sibudu Cave was exposed to heat in the hearths for the purpose of colour-change. This would suggest that yellow ochre, at least in some degree, had a specific purpose at this site.

Ochre residue has, together with resin and other plant-residues, been confirmed on the blunt end (proximal end/backed edge) and medial section on a large number of different kinds of artefacts (such as points, scarpers and backed segments) at Sibudu. This indicates that ochre was an active ingredient in adhesives used for hafting. However, as mentioned in Chapter 2, coarse ochre seems to have been critical for ochre to be an effective ingredient in hafting. The texture of ochre varies significantly in different geological forms (Hodgskiss 2010:3345). As there are several different ochre outcrops available in the caves proximity, it is probable that ochre was collected from more than one source. Thus, the ochre at Sibudu Cave most likely has textures ranging from the coarse grained ochre necessary for hafting, to finer-grained ochre, suggesting that ochre had additional functions.

The absence of colour-altered yellow ochre at Sibudu could be explained by the presence of several haematite outcrops in proximity to the cave, making colour-alteration of yellow to red ochre unnecessary. Again, it is difficult to say whether ochre collection from outcrops this close to the site could be considered time consuming. The large amount of ochre brought back to the site would on the other hand clearly be energy-consuming. In addition, the extensively utilized ochre record of Sibudu indicate that a substantial amount of time and energy was set aside for this purpose, suggesting that ochre collection and processing were costly activities. The morphology of the ground ochre pieces, and the deposits of ochre powder, points in the same direction. The completely utilized ochre had to have undergone substantial amount of grinding (e.g. Wadley 2005a:Figure 2a). As even prolonged grinding of hard haematite only produces a small amount of powder, the ochre pieces must have been kept for repetitive use, thus suggesting that they were special or considered ideal for the people processing them.



Figure 12: Possible *Afrolittorina africana* shell beads from Sibudu Cave, KwaZulu-Natal, South Africa. Illustration by d'Errico, et al. (2008:2680).

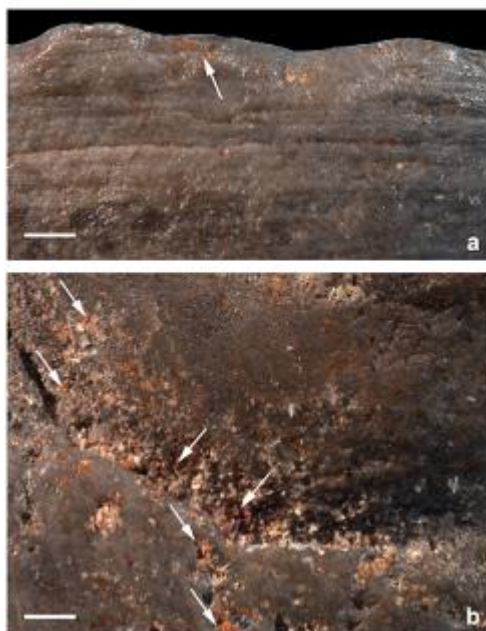


Figure 13: a (surface) and b (spire): Close-up view of the ochre stained shell shown in Figure 12b. The arrows show where the red ochre residue is imbedded. Illustration by d'Errico, et al. (2008:2681).

The value of the ochre might also be evident considering the ochre stained *Afrolittorina africana* shells from Still Bay layers at Sibudu. Perforated shells with marks of use wear from the MSA have generally been interpreted as beads after they were first reported from 77 ka layers at Blombos Cave in 2004 (d'Errico, et al. 2005; Henshilwood, et al. 2004) and from Grotte de Pigeons, Taforalt, Morocco in 2008 (Bouzouggar, et al. 2007:9968). The six *Afrolittorina africana* shells from Howiesons Poort and Still Bay layers at Sibudu Cave have traces reminiscent of such beads as three of them are perforated and one of them shows indications of use/wear. This shell was also covered in red ochre on the entire surface (Figure 13a), particularly in micro-pits located on the shells spire (Figure 12b and 13b). Ochre was possibly embedded there through being hung on an ochred string, rubbing against ochred hide, from leather bags that held the shells, from the skin of the person wearing them, or they could have been deliberately coloured. This has led d'Errico, et al. (2008:2682) to believe that the six shells are possible shell beads collected, transported and modified by the Sibudu occupants. However, as only

three out of six shells are perforated and only one shows traces of ochre, additional discoveries of shells with similar modification is considered necessary to confirm that these were used as ritual objects at Sibudu.

### 5.3.1 Summary

If we assume that Sibudu was not constantly occupied, then the relatively large ochre assemblage recovered from Sibudu Cave, together with the consistent collection and

utilization of red ochre, suggests that ochre at Sibudu was incorporated into a ritual system of repetitive use, redundancy, sequencing, invariability and high amplitude. The relative short-time span of MSA occupation at the site and the large amount of ochre, indicates that ochre was an important aspect of their society. The discovery of yellow ochre powder on sandstone-spalls and crusted hearths, as well as patches of yellow ochre powder and utilized and unutilized lumps, suggest that yellow ochre, although in a smaller scale, could have been used in a similar manner. The hard haematized ochre, and the high proportion of intensively utilized red ochre pieces (from rubbing and/or grinding), is evidence of ochre being repetitively modified in a similar fashion throughout the MSA occupation period, resulting in an activity of high amplitude and redundancy. This form of modification is also indicative of ochre powder being the main goal for ochre collection and processing at Sibudu. The large amount of ochre at Sibudu, together with intensive utilization and possibly safe-keeping of highly esteemed ochre pieces and powders, suggest that the ochre collection, processing and use was a costly time- and energy-consuming industry. Although some of the ground ochre was used for utilitarian-purposes (such as hafting – outlined in Chapter 5.8), all the characteristics of ochre used in ritual activity are present at this site.

#### **5.4 SITE GnJh-15 KAPTHURIN FORMATION, KENYA**

All the ochre from the Kapthurin Formation in Kenya has been discovered right below a Bedded Tuff at the site dated to c. 285 ka. The amount of red ochre at GnJh-15 could suggest that ochre was collected for a specific purpose. Because there are no processing marks on the ochre pieces, it is difficult to say how and for what purpose it was utilized. The morphology of the granular powder might suggest that ochre was utilized to gain ochre powder. This is supported by the red stained soil and ochred grindstones found at the site. The granular powder suggests that ochre was crushed with a stone and pulverised, while the ochred grindstones also indicate that some ochre was ground. This would suggest that different ochre minerals of different geological forms were collected at Kapthurin. All in all, the ochre record of GnJh-15 indicates that if there was an ochre industry, then this industry was focused on extracting ochre powder.



The presence of red ochre and ochre stained grindstones at the site has been interpreted as indications of ochre powder production as far back as >285 ka (e.g. McBrearty 1999; McBrearty and Brooks 2000; McBrearty and Tryon 2006). McBrearty (2007:140) suggest that the use of ochre at this site indicates a presence of symbolic communication and ethnic identity before 285 ka: the red ochre implies symbolic behaviour and suggests that AMH was cognitively modern by 285 ka. However, the ochre material has never been properly analyzed and there are no clear signs of symbolism or ritual at the site. Despite this, red ochre from site GnJh-15 is often referred to when researchers talk about red ochre processing and ochre connected to colouring material and ritual behaviour (e.g. Barham 2002b; d'Errico 2003; Marean, et al. 2007; McBrearty 1999; McBrearty and Brooks 2000; McBrearty and Tryon 2006; Wadley 2005b). It is therefore assumed by many that ochre was used within a ritual system at GnJh-15 by 285 ka. The processing of ochre at so early a date is, according to McBrearty (2001b:92), indicative of this behaviour originating at the same time as *Homo Helmei*, dated at Florisbad, South Africa, to ~260 ka. This species is similar to AMH in both behavioural and physical aspects, and it has been suggested that the two species are in fact the same (Stringer 1996). If this would prove to be true, then the origin of AMH and ochre processing could both be corresponding to the beginning of the MSA (McBrearty 2001b:92).

Although it is possible that ritualized behaviour was developed by 285 ka, the evidence is too scarce to give a definite conclusion regarding ritual activity at site GnJh-15. The ochre material does show signs of intensive collection focused on red hues, which most likely was processed to obtain ochre powder. This suggests that at least a repetitive and invariable pattern of ochre collection and utilization was present during this short period of time, resulting in a relative redundant amount of ochre. Still, ochre is only found in the youngest layers at GnJh-15. If this was the beginning of an ochre tradition, then the GnJh-15 MSA occupants must have changed location shortly after 285 ka. Although the ochre material at GnJh-15 is poorly preserved and lacks a detailed description, it is possible that ochre from c. 285 ka layers GnJh-15 reflect ritual activity. Further excavations and analyses of ochre from this site is considered necessary to reach a definite conclusion regarding the purpose of this ochre record.

### **5.5 SITE 8-B-11, SAI ISLAND, NORTHERN SUDAN**

The ochre material at Sai Island stands out as being the only MSA site where yellow ochre seems to have been more frequently used than red. This is evident through the predominance of yellow ochre, and the preference for yellow among the utilized pieces. The ochre material is relatively small compared to other MSA sites with similar age (such as Twin Rivers). Although the number of ochre pieces differs from the GnJh-15 Kapthurin material with only >10 pieces, the size and weight (considering that most pieces is under 5 mm) of the Sai Island material reflect a generally smaller record. Also, ochre use at Sai Island seems to be restricted to the Lower Sangoan levels, suggesting that it was collected within a relatively short period of time, for it then to be abandoned.

Only a few of the recovered ochre pieces show signs of modification in the form of striations and rubbing facets, either by grinding, rubbing or scraping, which indicates that the modified ochre pieces were utilized for ochre powder. The small elongated chert pebbles with ochre residue could point in the same direction. However, the amount of modified pieces and the short time span of utilization are not enough to confirm an ochre industry. Van Peer and Vroomans (2004:18) have proposed that the ochre stained chert pebbles might have been used to grind down ochre into a powder. Based on the fact that only some of the chert pebbles are stained with yellow and/or red ochre, it is however not unlikely that these gained their colour through accidental staining. The possibility must also be considered that the chert pebbles could have had a utilitarian function, and were accidentally stained by people participating in ochre powder production. Most importantly, if these pebbles were used for ochre grinding, then one should expect all the pebbles to be stained and the ochre residue on the pebbles to be more mixed. Additional chert pebbles with or without ochre staining are necessary to reach a conclusion regarding their function. For now, because only some of the pebbles have colour on them, the most likely explanation is that the chert pebbles gained their colour through accidental staining, possibly from ochre minerals mixed in the floor-soil of the cave.

Van Peer and Vroomans (2004:16) have suggested that the two yellow streaks and one red spot on one of the chert pebbles could have been deliberately painted and thus represent one of the oldest symbolic items ever discovered (Van Peer and Vroomans 2004:16). However, there is no evident symbol, icon, pattern or any other recognizable ritual

feature on the stone (Figure 14). The fact that most of the yellow ochre residue appears in percussion marks could simply be due to the fact that large amount of residue would naturally clot/concentrate in grooves. The red spot however, seems to avoid grooves. This is



Figure 14: Chert pebble with ochre residue from Sai Island, Sudan. Illustration by Van Peer, et al. (2004)

consistent with the pebble being e.g. exposed to a person who had handled ochre powder. Such a smear from a person's hand would not be expected to clot in grooves, but

rather be concentrated on the protruding areas of the exposed stone. Ochre stains from a user's hand have earlier been proposed as an explanation for the ochre stained bone awls from Blombos Cave, South Africa (Henshilwood, d'Errico, et al. 2001:661). As this red spot avoids the grooves in the stone, it is unlikely that it is the result of post-depositional contact with red ochre in the soil. It is also unlikely that it was used to grind ochre as large amount of residue would be expected to clot in the grooves. Thus, the coloured pebble could indeed be the result of accidental staining, possibly from exposure to yellow ochre powder and the hand of a person handling red ochre.

It has also been proposed that yellow and red ochre was processed for ochre powder using the cut-out sandstone slabs as lower grindstones or mortars (Van Peer, et al. 2003:4,6). Even though these alleged grindstones/mortars have a coarse surface in which ochre residue would be expected to stick, especially in the pecked out grooves, they have no signs of ochre on them. It is therefore unlikely that these were used in ochre processing. As pointed out by Van Peer and Vroomans (2004:18), the surface of all four slabs are coarse, and appear to have been pecked and not ground, suggesting that they might have worked as anvils for percussion activities, or perhaps in connection with food processing. Although it is

evident that the Sai Island occupants were extracting some ochre powder, there is too little evidence to support a ritual interpretation of this ochre record.

#### **5.5.1 Summary**

The ochre material from Sai Island is relatively small, and is only present in the Lower Sangoan (c. 223±19ka) levels. This suggests that ochre at Sai Island was not part of a prolonged industry focused on ochre powder production. The fact that yellow ochre dominates is not necessarily counter-evidence of ritual activity. However, there are other signs; the small amount of utilized ochre pieces, and the relatively quick abandonment of this activity, does not reflect redundancy or high amplitude. Thus, the Sai Island ochre material does not show signs that indicate a repetitive and invariable behaviour. As the ochred chert pebbles most likely are the result of accidental staining, they are not regarded as having a ritual function.

The short distance to several different ochre outcrops, and the small amount of ochre at the site, indicate that ochre collection and ochre powder processing were not costly time- and/or- energy consuming activities. There are no indications of exaggerated formality or iconic or indexical display. The predominance of yellow ochre is at odds with other corresponding MSA sites where red ochre dominates. Yellow ochre does not seem to have been exploited in a significant degree at other MSA sites until after 80 ka (e.g. from Howiesons Poort layers at Apollo 11, Klasies River and possibly Sibudu Cave). Additional excavations and analyses of the recovered ochre material are necessary to determine whether or not ochre was used for ritual purposes during the MSA at Sai Island. So far, the ochre material recovered from Sai Island is not indicative of ritual activity.

### **5.6 MUMBWA CAVES, CENTRAL ZAMBIA**

The material recovered from Mumbwa Cave in Zambia consist of 85 pieces of red and 19 pieces of yellow ochre, in addition to 335 pieces of coloured sandstone. Because there is no combined weight-data for the ochre material at Mumbwa, it is hard to say anything about the size of the material. The predominance of iron oxides (haematite and specularite) and

reddish sandstones at Mumbwa indicate that red was the preferred colour. This is also supported by the predominance of red ochre among the utilized pieces, together with the iron-rich baked clay “crayons” from unit VII which produce a red coloured streak. Barham, Pinto, et al. (2000:84) has interpreted these as intentionally shaped, heated and a possible source of colour. As the two baked clay pieces are similar in size, shape and colour, they are most likely the result of intentional shaping. Though this is more difficult to prove, the seemingly intentional morphology could suggest that they also were intentionally exposed to heat. However, there has been no mention of wear marks on these baked clay pieces which could have given a good indication towards their purpose.

Traces of grinding, rubbing and scraping are consistent with signs of ochre powder production. It is only possible to modify hard haematized ochre and very hard specularite by grinding, rubbing or scraping, suggesting that the unmodified pieces also were collected for the purpose of producing ochre powder. Barham has proposed that the ochre processing at Mumbwa might be evidence of ritual activity in the MSA (Barham 1995:69, 71). He suggests this might be a response to the environmental conditions in the late Pleistocene together with social stress (Barham 1998:709). Although this will be difficult to determine, the ochre material at Mumbwa does suggest that ochre was exploited for its colour. This is supported by the two pieces of iron-rich baked clay and red and yellow sandstone. The “V”- and “U”-incised ochre pieces could possibly be intentional. However, as no picture or descriptive details have been released, it will be difficult to determine if these were intentionally incised or merely scaped for obtaining ochre powder. Although sandstones are predominant, neither the red nor the yellow sandstones have the natural staining properties of the iron oxides and iron hydroxides. They do, however, release colour when soaked in water, which could suggest that they were collected for this ability.

The occupation of unit VII (c. 107±11 ka - 130±6.2 ka), which has provided the largest amount of ochre from any layers at Mumbwa (Table 7), seems to reflect a time when the exploitation of ochre blossomed. The amount of ochre brought into the site in this period and the iron-rich baked clay pieces, together with the only utilized pieces found at Mumbwa, indicate that the people occupying the site during this time period participated in ochre powder production. This activity was focused on red hues, though yellow ochre was also included. Although limonite was more frequently collected than specularite during the

occupation of unit VII (Table 8), limonite is absent from any layer post-dating 170 ka, suggesting that its collection was connected to the seemingly time-restricted ochre industry in VII. However, both specularite and haematite are found in the less extensive excavated units IV and V (Table 8), suggesting that these might also have been connected to this industry, thus extending the time-range. This also concerns unit IX, but as the fully excavated unit VIII have shown signs of intermittent use of the cave, it is possible that unit IX share a similar trend as seen in unit VIII and unit X (Table 8).

The relatively short distance to outcrops of all the ochre minerals recovered at Mumbwa makes it difficult to say if ochre collection required planning and was considered a time-consuming activity. Specularite collection might be the exception. However, as there have only been reported two pieces consistent with geological forms found in The Nambala Hills, it is more likely that the MSA occupants at Mumbwa exploited the hard lateritic specularite sources close to the site. The many different ochre minerals recovered from Mumbwa suggest that its occupants were familiar with the landscape and the available materials. It also suggests that they knew of the different properties of the diverse ochre minerals and how best to process them. Even though the ochre sources were relatively close to the site (up to 15 km), collecting all the different kinds of ochre minerals would require planning and thus be considered time-consuming. In addition, Barham (1995:68) has reported blocks of modified haematite weighing 1 kg and more from MSA levels at Mumbwa. This would suggest that the Mumbwa material is of substantial amount in both numbers and weight, and that collecting it would have been energy-consuming. Ochre collection and transport at Mumbwa is therefore considered to be a costly activity.

#### **5.6.1 Summary**

According to the number of ochre pieces, the consistent utilization methods and the possible high weight of ochre collected and brought to Mumbwa, the material reflects high amplitude and redundancy, suggesting repetitive and invariable behaviour among the MSA occupants. Although signs of ochre processing are relatively few, the consistency in colour preference amongst both utilized and unutilized ochre pieces, in addition to the iron-rich baked clay pieces and exploitation of red and yellow sandstone, suggest that ochre was being utilized for its colour. Because unit IV and V have not been sufficiently excavated, it is possible that

these respective periods contained a similar trend as unit VII, resulting in a prolonged period of time for the possible ochre tradition at Mumbwa. The different ochre minerals recovered at Mumbwa suggest that the people living there were familiar with their properties and went to considerable lengths to procure them. The collection of ochre would thus require a certain degree of planning. Extensive ochre collection, transport of large ochre pieces and processing imply that these were costly time- and energy-consuming activities at Mumbwa.

Although the ochre material at Mumbwa does indicate an ochre powder production focused on colour, it will be difficult to confirm whether or not there is sequencing and exaggerated formality at the site until further excavations in the less extensively excavated units have been conducted. Still, the ochre material presented above, together with the evidence of long-term use of hearths and windbreaks, could indicate that the Mumbwa occupants lived in a society with complex behaviour participating in ritual activity.

## **5.7 PINNACLE POINT CAVE 13B, WESTERN CAPE, SOUTH AFRICA**

The high percentage of utilized material at PP13B (14.6% of all cases, >50% of the mass) is suggestive of an ochre industry. This is enhanced by the predominance of red, very red, very dark and saturated red ochre, both among the utilized and unutilized pieces, distributed over a relatively long period of time (c. 75.000 years). As only <2kg of ochre has been recovered at PP13B, the substantial amount of utilization might suggest relatively few occupation periods. Watts (2010:407) has interpreted the predominance of very red, saturated reds and reddish-browns at PP13B as indications of haematized mineral forms being most desired when ochre was collected. The consistent collection and utilization of red ochre at the site does indicate that red was the preferred colour. It also indicates that ochre was collected for a specific purpose. That this collection and utilization seem to have had a special focus on iron oxides ( $\frac{1}{4}$  of all modified pieces consist of iron oxide), might suggest that the most saturated, very red ochre was the most highly desired product. That utilized pieces show less variance in colour choice than the unutilized supports this proposition. This preference for red can also be seen among the utilized and unutilized ochre material reported from c. 164 ka layers by Marean (2007:906), indicating that the industry was continuous and consistent through all the ochre-bearing layers.

The predominance of hard iron rich materials suggest that both red colour and hardness was desired traits. As mentioned earlier, hard haematized ochre can only be modified by rubbing, grinding or scraping to produce ochre powder. Watts (2010:392) and Marean (2010:436-437) have concluded that the utilized ochre material at PP13B was processed to produce red ochre powder presumed to have been used for body paint. As almost 94% of the utilized ochre from all three excavated areas show signs of grinding, it is assumed that ochre was collected for the purpose of being ground into a powder. The amount of powder obtained from such utilization would be small, suggesting that intensively utilized pieces were kept for repetitive episodes of use. This is supported by some of the ochre pieces found at PP13B showing signs of being intensively utilized, together with different kinds of utilization methods (such as grinding and scraping) and multiple episodes of use, thus implying that they were kept for some specific purpose. Watts (2010:403) also speculates that the presence of large >10g unutilized iron oxide pieces with similar properties as their smaller utilized counterparts, might be due to these pieces being of high value. It is difficult to imagine that larger pieces of iron oxide similar in colour and geology as the modified pieces were not intended to be used. Thus, they might have been kept for use in the future. By numbers and mass recovered from the three excavated areas, there seems to be an even distribution of ochre utilization, suggesting that there was no commonly selected area where ochre would be utilized. This could indicate that ochre processing was not a specialized activity, but rather something in which the whole group participated.

The degree of utilization varies among the modified pieces (Table 10). Watts (2010:408) has suggested that the intensively ground pieces only account for 11.9 % of the utilized pieces because of the easy access to raw materials from the local source 5 km to the north, throughout the occupation period. This is consistent with what is seen in the BBC3 phase at Blombos cave, when a local Bokkeveld outcrop was exposed and ochre was easily accessible. However, as no distinctly yellow ochre or sandstone have been found within 10 km of the site, it is possible that ochre sources further from the cave also were exploited. As sandstone is the predominant ochre mineral at PP13B, ochre collection would require planning. Planning and collection of the different ochre minerals from several outcrops, some of them possibly 60 km from the site, suggest that ochre collection was a time- and energy-consuming activity, however this is not necessarily at odds with Watts' proposition.



Sources of red ochre are found locally and would be easy to collect, thus lowering the necessity to intensively utilize them. This supports the proposition that ochre was collected from several outcrops, a costly activity which would demand planning, as well as time and energy.

The disproportionate amount of dark red nuances at PP13B, indicate that ochre was incidentally or deliberately heated to produce red ochre and darker red nuances (Watts 2010:408). This can be connected to the small amount of yellow ochre at the site, and the fact that this is more abundant at areas without hearths. The high percentage of utilization of very red and very dark nuances from 100 ka and onwards, could thus be indicative of deliberate colour-alteration by heat. Marean (2010:436) and Watts (2010:409) has suggested that dark nuances were getting as highly esteemed as red. Although dark nuances might have gained a higher preference, these dark pieces were mostly red, suggesting that if ochre was deliberately heated for colour-alteration, dark red, and not dark hues in general, was the desired product. Although there are other colours present at the site (such as yellow), these occur in too low frequencies to be considered desired colours. Thus, yellow was recognized, but it was not desired, and can therefore not support the BCT theory.

Watts (2010:392) has suggested that the c. 100 ka ground ochre piece with fourteen

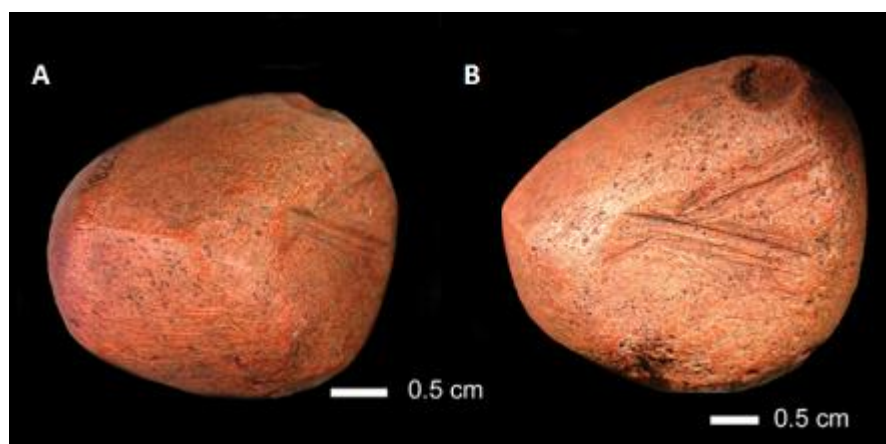


Figure 15: Scraped incisions resembling a "V" on an ochre piece from Pinnacle Point 13B, South Africa. Illustration by Watts (2010:406)

facets and scraped juxtaposed striations might have been intentionally made. This is primarily supported by such striations not being able to account for powder production. In addition, they resemble scraped

striations on ochre pieces from BBC 2 levels at Blombos Cave, South Africa (Henshilwood, et al. 2009), as well pieces from MSA II and Howiesons Poort contexts at Klasies River Mouth, South Africa (Knight, et al. 1995:88). Watts (2010:405) has described the incisions as a

“chevron”, thus implying that it is a pattern. The incisions on this piece does resemble a “V” (Figure 15 A and B), but the depth and length of the incisions do not seem to be constant and are not repeated on the other incised ochre pieces in the same layer (Watts 2010:406). The ochre piece has also been intensively ground. Although it is about 3.5 cm wide, it might have been considered as nearly complete. One must consider the possibility that the striations could be a last attempt of procuring ochre powder from this piece. Alternatively, the ochre piece was for some reason highly desired and kept safe for repetitive episodes of use. It is on such pieces we would expect to find ritual expressions. With only one single incised piece no clearer answer as to whether or not these incisions were deliberate can be made.

Watts (2010:409) has suggested that as fine-grained ochre minerals seem to have been preferred, ochre for hafting cannot be inferred on PP13B. However, fine-grained sedimentary forms are only predominant in the oldest ochre-bearing layers at the site. Also, the different ochre minerals found at the site, and the variance in hardness of this ochre, suggest that ochre of different geological forms was collected. This would imply that ochre with different grain-sizes also was present (such as coarse siltstone), thus not rejecting the hafting hypothesis. However, as lithics with ochre-bearing adhesives have not been reported from at PP13B, there are currently no grounds for supporting the ochre in hafting hypothesis at this site.

### **5.7.1 Summary**

The consistent colour choice among both utilized and unutilized ochre from the time periods in which ochre has been recovered from PP13B, and the fact that over 50 % of the ochre material recovered from the site has been utilized, suggest that the people living at the site were involved in an intensive ochre powder industry focused on red, very red, very dark and saturated red hues. As the ochre found at PP13B is only the leftovers from this industry, we must assume that the amount of ochre brought into the site was considerably larger. This implies that the ochre industry at PP13B was of high amplitude and redundancy, suggesting repetitive and invariable behaviour. The consistent colour choice and utilization method over a long period of time also suggest sequencing. The presumably vast amount, together with collection of ochre from several different outcrops, some of them perhaps as far away

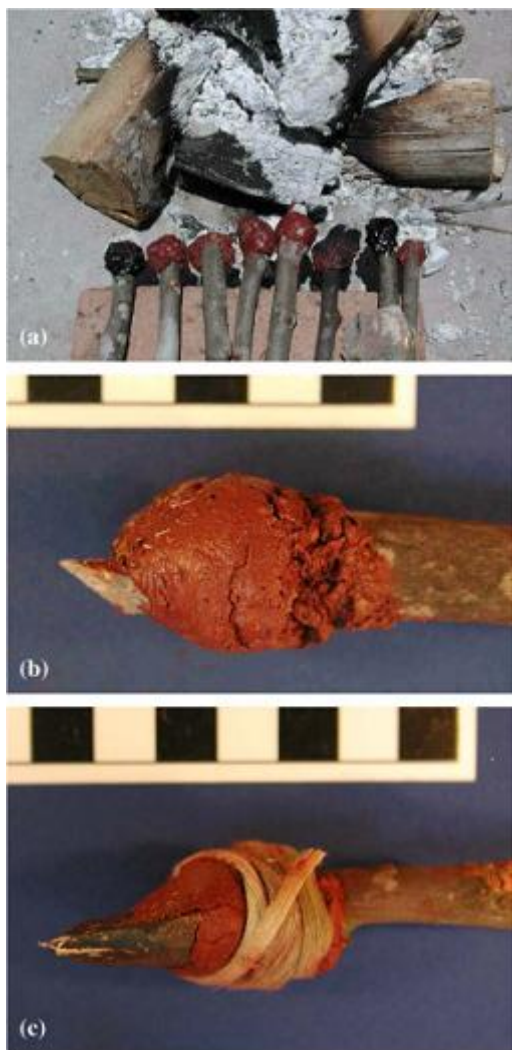
as 60 km, would demand some degree of planning, as well as time and energy from other necessary activities. Combined, this would imply that the ochre industry was a costly activity.

The relatively large amount of dark hues found at the site post-dating 100 ka, together with the small amount of yellow nuances near hearths, could suggest that both red and yellow ochre was heat-treated to obtain desired hues. As such dark hues have been intensively utilized, we must assume that they were highly esteemed, perhaps as much as red hues after 100 ka. This would imply that ochre powder had a specific purpose. Although ochre powder could be used for utilitarian purposes (such as hafting), there is no apparent evidence of this at PP13B. The presence of a possibly intentionally incised ochre lump at the sites could indicate use of abstract symbols at the site. Thus, both the red ochre powder and the incised ochre lump could be connected to ritual activity. This is supported by the proximity of the site to Blombos Cave where similar incised ochre pieces have been found in corresponding layers, implying that the PP13B occupants probably participated in extraordinary behaviour and exaggerated formality. Thus, the ochre material recovered from PP13B indicates that ochre was used in ritual activities.

## **5.8 DIFFERENT CONTEXTS**

In addition to ochre used in ritual activity, ochre has also been connected to utilitarian functions. As mentioned in Chapter 2, the foremost among these utilitarian hypotheses is ochre used in adhesives for hafting.

At Sibudu Cave (KwaZulu-Natal, South Africa), ochre residue has been discovered on the proximal and medial section (e.g. see Table 6) on a large number of lithics (points, scrapers, backed segments, “other retouch”, flakes and chunks) from Howiesons Poort and post-Howiesons Poort layers (as outlined in Chapter 4.2.3). In addition to ochre, resin is concentrated on the same parts of these lithics (Lombard 2004, 2005a, 2006a; Williamson 2004), suggesting that they were connected in some way. That the ochre is concentrated on the blunt edges instead of the sharp edges indicates that these tools were not used to process ochre. Based on microscopic analyses by Lombard (2004, 2005a, 2006a, 2011) the lithics are believed to have been hafted to wooden shafts and used as hunting weapons or



**Figure 16: Experimental studies of ochre mixed with resin for adhesives in hafting, conducted and illustrated by Wadley (2005b:7)**

knives. This is supported by plant tissue and woody residue on the proximal end as well as animal residue (such as fat, tissue and blood) on the distal/sharp edge of the lithics (e.g. Lombard 2004:39; Lombard 2005a:286; 2006b:29). Experimental studies executed by Wadley (2005b:1), confirm that ochre is a useful loading agent in adhesives for hafting (Figure 16), which thus support the hafting proposition. Lithics with ochre and resin on the proximal end and medial section have also been discovered in Howiesons Poort layers at Rose Cottage Cave, South Africa (Gibson, et al. 2004:1), and Umhlatuzana Rock Shelter, KwaZulu-Natal, South Africa (Lombard 2007:413). In addition, backed tools, possibly hafted, are found in the rich ochre bearing layers at Twin Rivers as well as in Howiesons Poort levels at Klasies River main site (Wurz and Lombard 2007). This suggests that the hafting industry, and perhaps ochre used in adhesives for hafting, was spread throughout southern Africa by >60 ka.

In addition to ochre in adhesives for hafting, ochre has been found on the working edge of lithics and shells (Henshilwood, et al. 2009:31-38), as well as embedded into the polish of bone tools at Blombos Cave (Henshilwood, d'Errico, et al. 2001:661). Ochre residue has also been discovered on the working edge of some lithics from Sibudu Cave (Lombard 2004:Table 5) and Rose Cottage Cave (Gibson, et al. 2004:Table 3). This has sometimes been interpreted as ochre was being used as a hide preservative. Ochre on scrapers together with the antiseptic properties of ochre has resulted in interpretations of ochre in connection to hide working (e.g. Mandl 1961; Wadley, et al. 2003:662). However, Williamson (2004:175) states that the small amount of ochre residue on the distal end of scrapers at Sibudu suggests that these scrapers were not used for this purpose. Experimental studies have

shown that iron oxide is not ideal for preserving hide (Watts 2002:3). This is also supported in the ethnographic record where iron oxides never have been reported as a hide preservative (Watts 2002:10). Ochre for preserving hide is therefore heavily disputed (e.g. Wadley, et al. 2003:662; Watts 2002; 2009:72), and might rather, as suggested by Watts (Watts 2002:3), have been applied in the finishing stages as a purely ornamental inclusion.

Ochre used in hafting, for medicine, for protection against the elements and possibly for supplementing iron in the diet, would require ochre powder, and could thus be part of the reason for the intensive utilization and ochre powder production during the MSA. These ochre functions would not leave any physical evidence other than powder and utilized lumps, making it impossible to separate ochre used for such utilitarian functions and ochre used for ritual purposes. Unlike the hide preservative hypothesis, these utilitarian functions are supported in either the ethnographic (e.g. Clark 1975) (Figure 2), and/or archaeological record (e.g. Gibson, et al. 2004; Lombard 2008a; Wadley 2001) or by experimental archaeology (e.g. Wadley 2005b, 2010b). Thus, there is good evidence of ochre used for utilitarian purposes during the MSA.

### **5.8.1 Ochre used in several contexts?**

Based on the evidence outlined above, it is evident that ochre also served utilitarian purposes during the MSA. This does not necessarily mean that the utilitarian use of ochre always existed within a utilitarian context. As outlined in Chapter 3, Liénard and Sørensen (2010) have proposed a hypothesis that posits that one can change the function/meaning of an ordinary object if the object is brought into a different context. Ordinary objects are readily identifiable and recognizable, and would therefore be ideal objects in ritual activity for making the ritual both salient and attention-grabbing.

As all the objects mentioned above also have been discovered without ochre staining, it is possible that the ones with ochre were used within a ritual context. Several researchers have used the phrase “added value” when ochre has been discovered on ordinary objects (e.g. d'Errico and Stringer 2011:1062; Watts 2009:83) and when ochre in adhesives has been discussed in connection with ritual behaviour (Lombard 2007:415). However, “added value” might not be the right phrase for this in every case. According to

Liènard and Sørensen (2010), an ordinary object combined with familiar actions in new ways, results in that object being brought into a new context where it is transformed. Thus, ochre on ordinary objects might not always have been given an added value, but instead a new value would be introduced.

Although ochre in adhesives for hafting has been found on numerous lithics, many of the microscopically analyzed lithics from e.g. Sibudu Cave with resin and other vegetal remains suggestive of adhesives, did not have ochre on their blunt end (Lombard 2005a:Table 4). This could be explained by the different properties of various filler/loading agents. However, red and yellow ochre have both proved effective as emulsifiers in adhesives (Wadley 2005b). The consistent choice of red ochre for lithics hafted with this adhesive-mix might therefore indicate that the use of red was essential. Arguably, the ochre powder could have been yellow and transformed to red from heat used to dry the adhesive. However, experimental studies by Wadley (2005b:10) have shown that yellow ochre in adhesives turns dark brown rather than red when exposed to heat, indicating that red ochre was initially used. Thus, ochre used for utilitarian purposes (such as hafting) would be used for its beneficial properties, but also for its association to rituals, making it possible to use within both contexts. When brought into a ritual context, the function and meaning of the red ochre changes. Ochre used in both a utilitarian and a ritual context are connected as it is the same ochre, but in a ritual context the ochre would not be connected to its utilitarian function, but be transformed and given a new function and meaning. It is possible that because ochre was so successful as a loading agent in adhesives, red ochre was used to haft tools to give them an “added ritual value” when used for hunting. In that case, the utilitarian and ritual function of the red ochre powder would be connected. As animal residue (fat, blood and other animal tissue) have been discovered on the working end on some of these lithics, it could be imagined that red ochre in adhesives was connected to hunting rituals conducted prior to a hunt to gain favourable conditions.

Bone tools with ochre staining have been discovered in 75 - 82 ka layers at Blombos Cave, South Africa (d'Errico and Henshilwood 2007:148; Henshilwood, d'Errico, et al. 2001:661). According to their rounded tip, the bone tools have most likely been used as awls or projectile points. Because the ochre is embedded into the polish of the bone tools, it has been suggested that it was not transferred post-depositionally, but rather from use or a

user's hand. *"Experimental piercing of ochred hides by one of the authors (d'Errico et al., 2000) demonstrates that the ochre pigment permanently stains the bone awls used in this activity"* (Henshilwood, d'Errico, et al. 2001:661). The question is therefore, was hide pierced by bone tools in a strictly utilitarian context, or was there another reason for this activity? If, as argued by Watts (2002), ochre is not ideal for preventing hide to decay, then the ochre must have been applied to the hide in a later stage of the hide preparation. Thus, there must have been plenty of time to pierce the hide before it was coloured. It is therefore possible that the bone tools used to pierce hide were used in this manner after the hide was coloured to obtain permanent colour and to give them an "added" or new value, which could suggest that they were used within a ritual context. This is supported by the geometrically engraved bone tools found at Blombos Cave from the same layer (d'Errico, et al. 2001). At that point in time, ritual use of ochre was firmly established at Blombos. If the colour on the bone tools was transferred from a user's hand, then we must assume, at least in this context, that the people handling the bone tools were aware of the ochre-transfer from hand to bone tool. It is therefore unlikely that this colour appeared accidentally, and a ritual value for these tools is possible.

This many-faceted discussion will be summarized in the following chapter. This is done to provide a clearer set of conclusions, which will answer the problem statements from Chapter 1.





## 6. SUMMARY AND CONCLUSIONS

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### 6.1 COMPARISONS BETWEEN THE SEVEN SITES

Except for Sai Island, all the selected sites show similar trends in their ochre record. One must remember that ochre recovered from MSA sites today is only a remnant, and that the actual amount of ochre brought to each site was most likely considerably larger. Sites, such as the three main sites Twin Rivers, Blombos Cave and Sibudu Cave, which have produced a large quantity of ochre therefore reflects a substantial ochre tradition. As demonstrated in Chapter 5, the characteristics of ochre in ritual behaviour are present at Twin Rivers, presumably as far back as >350 ka. At Blombos Cave, these characteristics are clearly visible throughout the whole occupation period. After 100 ka, abstract engravings on ochre and bones, as well as the presence of shell beads bear witness to a more extensive ritual tradition. Although Sibudu Cave is most often associated with utilitarian use of ochre, the ritual characteristics are also present, along with possible shell beads, suggesting that its inhabitants participated in ritual activities. Whilst the distance to ochre outcrops and the amount of ochre brought to each of the three main sites varies, the sites all have elements suggesting that ochre procurement required planning, time and energy; supporting that ochre collection was a costly activity. The effort put into obtaining the “right” kind of ochre indicates that the ochre itself was considered costly.

Although Mumbwa Caves requires further excavations in the less extensively excavated areas for sequencing and exaggerated formality to be inferred, the presence of the other ritual characteristics suggests that the people at Mumbwa Caves participated in ritual activities. Ritual characteristics have also been identified at Pinnacle Point 13B, including possible colour alteration and a possibly intentionally engraved ochre piece. As the GnJh-15 ochre material is restricted to a very short period of time, it is difficult to say if the above also applies to this site. The ochre material found at GnJh-15 does show similar signs of colour, material preference and utilization methods as the other sites (except Sai Island), suggesting that before abandoning this site, the inhabitants signs of an early ochre tradition possibly connected to ritual behaviour. As Sai Island does not project any of the ritual

characteristics outlined in Chapter 3, it is possible that ochre recovered from this site was used in a strictly utilitarian manner.

The engraved ochre slabs from Blombos Cave could be seen as evidence of exaggerated formality. One can only speculate that the engraved ochre reflects indexical symbols displayed on the bodies of ritual performers, as suggested by Durkheim (1912 [1969]). Although it is difficult to be certain about their functions, these engravings do reflect something extraordinary, most likely connected to ritual activity. This may also be the case for the incised ochre pieces found in 100-75 ka layers at Blombos Cave, the incised ochre lump from 100 ka layers at Pinnacle Point 13B, the scraped/incised ochre pieces from >107 ka layers at Mumbwa Caves and the cross-hatched incisions found on a ochre piece from Howiesons Poort/Post-Howiesons Poort layers at Klein Kliphuis in South Africa. If all these ochre pieces were intentionally incised, then a more intensive and redundant ritual tradition is evident in sub-Saharan Africa from c. 100 ka. This is consistent with the possible heating/colour-alteration of ochre after 100 ka at Pinnacle Point 13B and Blombos Cave, and the baked clay “crayons” from c. 107 ka layers at Mumbwa Caves. The discovery of shell beads, some of them with ochre incorporated into the polish in 82 ka layers at Grotte de Pigeons in Morocco and in 75 ka layers at Blombos Cave, as well as possible shell beads from corresponding layers at Sibudu Cave, also support this. I therefore find it likely that ritual behaviour can be inferred on this ochre record, but it is difficult to conclude anything about the reason for the consistent colour choice or the nature of the rituals.

The ochre colours recovered from the selected sites all support the light/warm term from the revised BCT hypothesis, whereas there is no evidence to support the dark/cold term. Thus, the colour choice of the MSA people at these sites cannot be explained by BCT, suggesting that this hypothesis may need to be considerably revised or dropped in connection to early colour choice. Therefore, the consistent choice of red must have derived from some other cause, perhaps, as outlined in Chapter 2, because of its resemblance to the red life-giving blood.

Knight (2010b:299) has argued that the persistent utilization of the reddest ochre at Blombos Cave matches the criteria of what you would expect to find at sites where female coalitions once operated (FCC). In Knight’s opinion the Blombos Cave ochre is therefore a

reflection of such ritualistic culture. The interpretation of prehistoric ritual spanning this amount of time is connected to the concept that there is a common human understanding of the world. These are ideas we open up to when we allow the interpretation of ritual objects at all. In my opinion the interpretation of meaning is more problematic, due to the fact that we base our interpretation of artefacts and features hundreds of thousands years old around modern ideas. It seems unlikely that people living in Africa >100.000 ya, in an environment and world so different to ours, would think and understand things the same way we (or various tribes) do today. Other than establishing the ritual characteristics presented in this thesis, it is very difficult to infer specific rituals based on the MSA ochre record. One must therefore concentrate on signs of ritual behaviour in general, as these are sufficient to identify ritual behaviour at a site.

## **6.2 OCHRE WAS USED WITHIN SEVERAL CONTEXTS**

The consistency in using red ochre in adhesives, together with the large amount of lithics with this adhesive-mix, points towards a repetitive and invariable behaviour. This may indicate that the utilitarian lithic tools with ochre residue, on the distal as well as the proximal end, were also used within a ritual context where the red ochre transformed. Although ochre on an ordinary object could reflect that the object was used within a new context, it might not have been completely transformed in every case. Red ochre could have been embedded into the adhesives of hunting weapons or smeared on the tip of a weapon, resembling the blood of an animal, to enhance their chances of a successful hunt. This would give the lithics an “added value”. Thus, ochre used for utilitarian purposes and in a utilitarian context is not necessarily the same thing. As has been demonstrated, red ochre is a useful ingredient in adhesives for hafting. If the hafted tool was brought into a ritual context, then the ochre powder still had a utilitarian function, but was not connected to a utilitarian context. Thus, ochre could have been used both in a utilitarian and in a ritual context.

### 6.3 FINAL REMARKS:

Altogether, the evidence presented in this thesis indicates that ochre was connected to ritual activity throughout the entire MSA. It has also been demonstrated that red ochre found in MSA deposits may have been used in both a utilitarian and a ritual context. Depending on the intended purpose of the ochre used, it seems likely that the utilitarian and ritual functions could be connected. By identifying ritual behaviour at selected sites in Africa, one can also argue that the people conducting these rituals must have been cognitively advanced as they must have been able to multitask, store information outside the body and think abstractly to perform and understand these rituals. Although there is no common agreed upon template or theory for the arising of modern human behaviour, the presence of ritual activity does point towards advanced behaviour not seen in the African archaeological record prior to >350 ka. This suggests that the cognitive abilities and behaviour was starting to change in a more “modern” direction by >350 ka.

Costly signals as those outlined above would be expected to project meaning to other groups. For this to be effective, the messages must have been evaluated on an analog scale. This would suggest that if the ochre material does reflect ritual behaviour, then this behaviour was shared by more than one group. As has been demonstrated, a similar ochre tradition can be detected along the coast of South Africa (Blombos Cave, Pinnacle Point 13B and Sibudu Cave), in south central Africa (Twin Rivers and Mumbwa Caves) and possibly along the east coast up to the Kapthurin Formation in Kenya (site GnJh-15). This is supported by the evidence from sites listed in Tables 1 and 3. These tables indicate large amounts of ochre, consistent colour choice and similar utilization methods as the analyzed sites. The tables also suggest that the ochre trend continued along the western coast of South Africa up to Namibia. The evidence does not, however, support a continuous trend in northern Africa, at least not by  $152 \pm 10$  ka, as the Sai Island material does not reflect ritual behaviour so far. Since red ochre has been found in >92,000 year old layers in Qafzeh Cave, Israel (71 pieces, 1.14 kg), as well as incorporated into the polish of ten 82,000 year old *Nassarius gibbosulus* shells (beads) from Grotte de Pigeons in Taforalt Morocco, it is possible that the ochre tradition spread north after the apparent ritual development around 100 ka.

Finally, based on the sites analyzed, it seems that a ritual tradition can be traced from before >350 ka in southern Africa, until approximately 100 ka, when it developed and

intensified, leaving a more redundant and widespread evidence behind. This in turn leads to the implication that ritual behaviour may have been present before the development of our species, which could suggest that it was behaviour that triggered the evolution of our species, and not the anatomy that triggered the behaviour.



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## APPENDIX

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### APPENDIX 1: List of Abbreviations

LSA	Later Stone Age
MSA	Middle Stone Age
ESA	Early Stone Age
AMH	Anatomically Modern Humans
MHB	Modern Human Behaviour
FCC	Female Cosmetic Coalition (theory)
BCT	Basic Colour Term (theory)
BBC	Blombos Cave
my	Million Years Ago
ka	Thousand Years Ago
ya	Years Ago

### APPENDIX 2: Overall Time Periods:

Period:	From:	To:	ya
LSA	c. 40-30,000 (Southern Africa c. 20.000 ya)	c. 2000 (c. 200 ya in Southern Africa)	ya
MSA	c. 250,000	c. 40,000	ya
ESA	c. 2.7 my	c. 250,000	ya
UP	c. 40,000	c. 10,000	ya
MP	c. 300,000	c. 40,000	ya
LP	c. 2,5 my	c. 300,000	ya

### APPENDIX 3: Sub-Stage Time Periods

Sub-stage	Approximately Age	Reference
Iron Age	c. 2800 -1000 ya	(Ambrose 1998)
Post-Howiesons Poort	>55 ka	(Wadley and Jacobs 2006)
Howiesons Poort	c. 80 - 60 ka	(Lombard 2005b)
Still Bay	c. 85 - 70 ka	(Henshilwood, Sealy, et al. 2001)
MSA 2b (MSA II)	c. 115 - 70 ka	(Henshilwood, Sealy, et al. 2001)
MSA 2a (MSA I)	c. - 115 ka	

### APPENDIX 4: Mohs Hardness Scale

Mohs hardness scale:	Density
1	Soft
2	Fairly soft
3	Fairly hard
4	Hard
>5	Very hard



**APPENDIX 5: The approximate colour and density of the different ochre minerals referred to in the text.**

Ochre mineral	Colour	Density (Mohs scale)
Haematite	Red iron oxide	>4
Specularite	Red iron oxide	>5
Limonite	Yellow	>4
Sandstone	Red and Yellow	>3
Manganese dioxide	Dark red	>4
Siltstone	Reddish	3
Goethite	Yellowish to reddish	>5
Shale	Red	3